

AIR FORCE

and **SPACE DIGEST**

The Magazine of Aerospace Power / *Published by the Air Force Association*



THE SST AS A BOMBER—BETTER THAN AMSA?

Unquestionably yes, says Technical Editor J. S. Butz, Jr. A fanjet-powered military version of the Boeing supersonic transport, shown in artist's conception above, being refueled by a Lockheed C-5 tanker, would make an excellent, versatile, long-range bomber, in many ways superior to the AMSA, capable of penetrating any known or conceivable defense net.

See Page 36

There's a little bit of chicken in all of us.

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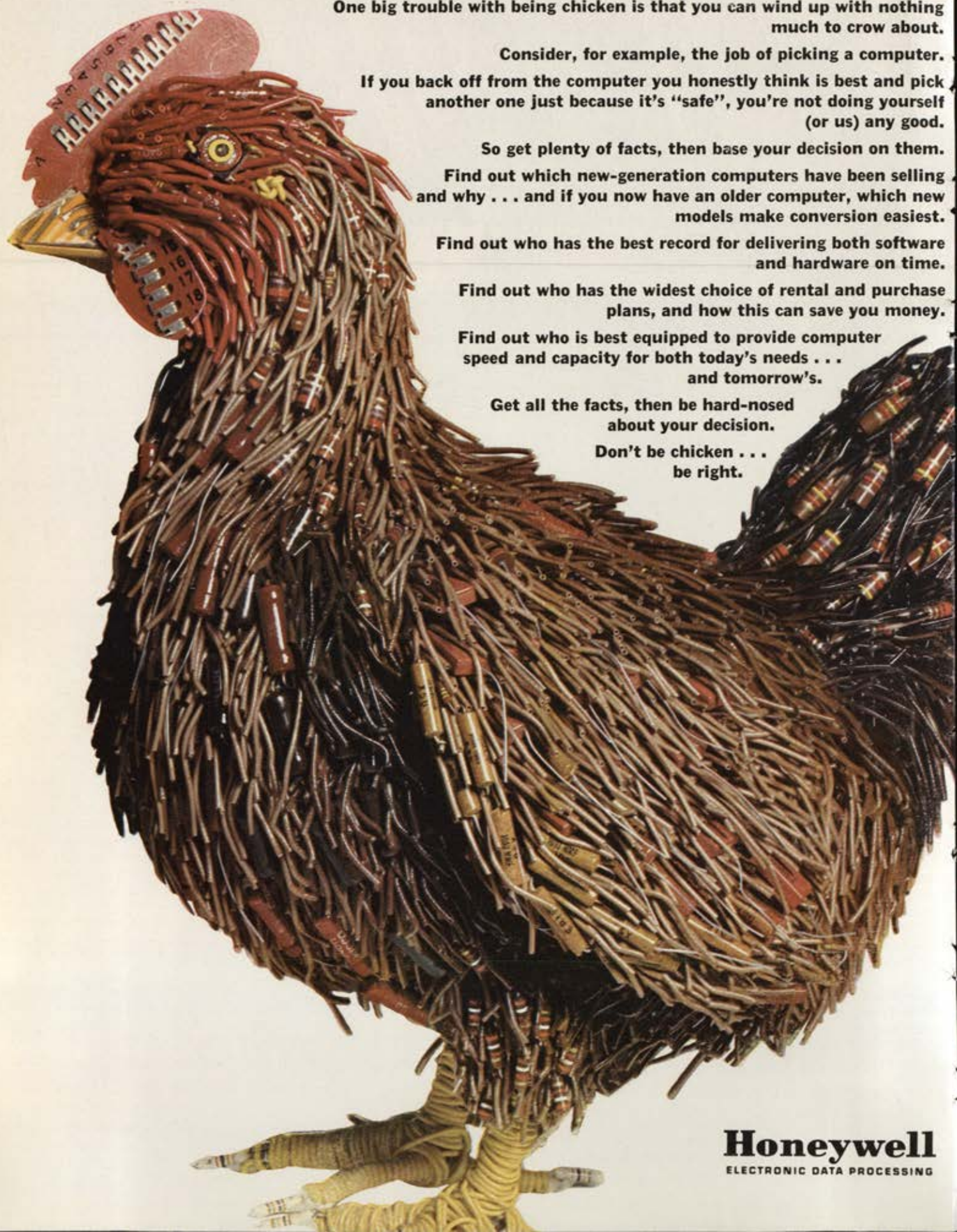
Find out who has the best record for delivering both software and hardware on time.

Find out who has the widest choice of rental and purchase plans, and how this can save you money.

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Dr. E. B. Carne,
author of "Artificial
Intelligence
Techniques";
Assistant General
Manager—Systems,
Greenville Division,
LTV Electrosystems.

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UNITED KINGDOM, BENELUX, SCANDINAVIA: Overseas Publicity and Service Agency Ltd., W. G. Marley; R. A. Ewin; A. M. Coppin; 214 Oxford St., London W.1, England (01-636-8296). **FRANCE:** Louis de Fouquieres; Marie-Helene Cousse; 26 Rue Duvivier, Paris 7, France (Sol 63-41). **GERMANY, SWITZERLAND, ITALY:** Dieter Zimpel, D 8012 Ottobrunn b. Munich, Burgmaierstrasse 18, Germany (Munich 34 98 20).

BPA AIR FORCE Magazine and SPACE DIGEST are published monthly by the Air Force Association, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006 (phone Area Code 202, 298-9123).



PRINTED in USA, by McCall Corporation, Dayton, Ohio. Second-class postage paid at Dayton, Ohio. Composition by Sterling Graphic Arts, New York, N. Y. Photoengravings by Southern & Lanman, Inc., Washington, D. C.

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ADVERTISING correspondence, plates, contracts, and related matter should be addressed to AIR FORCE/SPACE DIGEST, Advertising Hq., 880 Third Ave., New York, N. Y. 10022.

EDITORIAL correspondence and subscriptions should be addressed to Air Force Association, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006. Publisher assumes no responsibility for unsolicited material.

CHANGE OF ADDRESS: Send old and new addresses (including mailing label from this magazine), with ZIP code number, to Air Force Association, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006. Allow six weeks for change of address to become effective.

MEMBERSHIP RATE: \$7 per year (includes \$6 for one-year subscription to AIR FORCE/SPACE DIGEST). Subscription rate—\$7 per year, \$8 foreign. Single copy 60¢. Special issues (Spring and Fall Almanac Issues), \$1.25 each.

UNDELIVERED COPIES: Send notice on Form 3579 to Air Force Association, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006.

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FEBRUARY 1967

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Détente Versus Vietnam

By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

IN HIS State of the Union message President Johnson said he intends to pursue the Great Society, détente with the Communists, and the war in Vietnam. He discussed them in that order, which at least suggests that he places them in that order of political priority.

It is not within our area of editorial competence or necessity to comment on programs to help the underprivileged, combat crime, or control air pollution. We are aware that the aerospace industry, pioneer in systems management, harbors an impressive capability to deal with many of these problems. A start has been made. Also, we are convinced that technological progress, so much of it centered in the military and space efforts, holds great promise for the improvement of our society.

The President told Congress, "We are in the midst of a great transition from narrow nationalism to international partnership; from the harsh spirit of the cold war to the hopeful spirit of common humanity on a troubled and threatened planet." Then he offered evidence in support of this thesis.

He said that in Europe, where NATO has spent a year in turmoil that must bring silent cheers in Moscow, we "look forward to the time when greater security can be achieved through measures of arms control and disarmament. . . .

"We are shaping a new future of enlarged partnership in nuclear affairs, in economic and technical cooperation, in political consultation, and in working together with the governments of Eastern Europe and the Soviet Union."

He continued:

"Our relations with the Soviet Union and Eastern Europe are [also] in transition. We have avoided both the acts and rhetoric of the cold war. When we have differed with the Soviet Union, we have tried to differ quietly and with courtesy. Our objective is not to continue the cold war, but to end it."

The President then cited the United Nations' agreement on the peaceful uses of outer space; the pact to open direct air flights to Russia; the removal of 400 items from export control; the Export-Import Bank's new freedom to extend credit behind the Iron Curtain; the renewed cultural agreement with Russia; the upgrading of our legations in Bulgaria and Hungary; and, finally, the effort to increase US contacts with Eastern European countries.

He beseeched Congress to support this program, for example, by passing an East-West Trade Bill and approving a new consular convention with the Soviet Union.

When he turned to the war in Vietnam, the Presi-

dent predicted only "more cost, more loss, more agony." Present policies will be continued. The State of the Union message did not reflect the sense of urgency about the war that so many of us read in the election returns last November. The reason could be that there is a definite conflict between Mr. Johnson's attitude toward the cold war and its relationship to Vietnam and the course being pursued by Russia.

In the current issue of *The Reporter* magazine, Albert Parry, a highly respected expert on Russia, has detailed some facts on the magnitude of what he calls "the growing Russian presence in Vietnam."

Moscow is stepping up its aid to Hanoi, he writes, and our failure to interfere with traffic into Haiphong is a major factor in the support of North Vietnam's aggression. Red China is not the important supplier of war materiel. The Soviets claim "a larger share of this sea traffic. . . . Last August . . . more than half of all the ships then entering Haiphong were of Soviet registry."

The biggest port on the Black Sea is Odessa, and the Russians brag that its busiest route is the one leading to North Vietnam. Soviet sailors, the Russians say, are proud of their duty to deliver goods that "help the Vietnamese in their struggle against the American aggressors." Vladivostok is another important sailing point. Soviet seamen returning to that city find enthralled audiences where, Radio Moscow says, they "unmask US crimes for the working people."

It is no secret that SAM missiles and MIG-21 aircraft are not the only tools of war involved in this traffic. Mr. Parry says that in 1965 "North Vietnam received from the Soviet Union arms and military equipment worth half a billion rubles [\$555 million]. The list included rocket installations and conventional antiaircraft guns, MIGs and other planes, and tanks, coastal artillery, and small warships."

Our reconnaissance planes over Haiphong see all of this equipment being unloaded, and our pilots on bombing missions can testify to its lethality. There is no accurate estimate of the number of Soviet officers and soldiers on the scene. It must be substantial to ensure the operation of more than 5,000 antiaircraft guns and twenty-five to thirty SAM batteries.

If Mr. Johnson's objective is to end the cold war, and that is what he said in the State of the Union message, it follows that there is a requirement for some practical response from Moscow. The President maintains that when we differ with the Russians we do it "quietly and with courtesy."

American pilots can testify that the Soviet response is heavy flak—the heaviest in the history of air warfare—and that it is neither quiet nor courteous.—END



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SCIENCE/SCOPE

Practical benefits to mankind from space technology are being dramatically demonstrated by the first Applications Technology Satellite (ATS-1), launched December 6 by NASA. Huge satellite, built by Hughes, includes a dozen scientific experiments in its 775-pound payload. Its "spin-scan" camera developed by Santa Barbara Research Center (a Hughes subsidiary), is returning high-resolution photos of the cloud cover over vast reaches of the Pacific and North and South America. Sent back to earth every 22 minutes, they herald a new era in accurate long-range weather forecasting. ATS-1 has also relayed color TV. Another significant experiment, in cooperation with seven airlines flying the Pacific, is continuous two-way voice transmission between aircraft in flight and ground control stations.

Sharper TV for a third of Los Angeles will soon be a reality, as the result of an ordinance granting three Community Antenna TV (CATV) franchises to Theta Communications of California, a joint venture company owned by Hughes and Tele-Prompter Corporation. Superb TV and FM reception will soon be available to initial subscribers in three areas covering 150 square miles. Theta Cal's CATV system will carry all 12 Los Angeles channels.

A new use for the laser's "light fantastic" is holography, a technique of lensless photography. Holograms give true three-dimensional images which can be viewed from any angle. Scientists at Hughes, where the first laser was demonstrated in 1960, are investigating holography for automatic target recognition ...believe it eventually may provide 3-D movies and television.

Ion propulsion is ready for two types of mission flyable during the next five years, say Hughes Research Laboratory scientists: unmanned probes to near planets and satellite control systems. New ion-beam-deflection technique developed by Hughes allows variation of direction and magnitude of thrust without moving parts, promises 20,000-hour-life systems for very precise attitude control and station keeping of stationary satellites.

The synergistic phase of the Phoenix program -- the integration of the Hughes-built missile with the Navy F-111B -- is being completed on schedule. In fact, a Phoenix missile made a powered flight from an F-111B 30 days ahead of schedule. Next milestone: guided flight to target. Hughes is also at work on a \$3-million contract for the Maverick air-to-ground missile, being one of two companies recently picked by the Air Force for the contract-definition phase.

One of the toughest Surveyor problems tackled by Hughes component engineers is developing a potentiometer that will perform reliably in the moon's hard vacuum. Lab tests show that wire-wound pots would be short-lived; their bearing lubricants would rapidly evaporate, deposit on the TV camera lens. Solution: a highly polished ceramic-base resistance element, a self-lubricating wiper contact (80% silver, 20% NbSe₂), and a Duroid bearing.

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An Editorial Policy

Gentlemen: . . . Until receipt of your November '66 issue I felt that *AIR FORCE/SPACE DIGEST* was without an editorial policy. I did not feel the views expressed in the magazine properly stated the opinion of those in the USAF who are in a position to risk their blood. Few of us in the military can speak our mind, be heard, and survive if we babble the truth. We must depend on others such as . . . the AFA to put forward our position. [The] editorial in the November issue expresses the situation admirably. Sam Butz's article on page 40 ["Airpower in Vietnam—The High Price of Restraint"] is another masterpiece in reporting.

I trust that . . . the staff of *AIR FORCE/SPACE DIGEST* will continue to seek out and report the truth.

COLONEL, USAF

Too Late for Our Deadline

Gentlemen: We of the 315th Air Division were extremely pleased with the prominence you accorded the article on this organization's Vietnam Airlift operation in the November issue of your fine publication ["Airlift in Vietnam," by Maj. C. L. Deare, Jr.]. As the accomplishments of the professional personnel of this Division are a source of deep pride to me, I was delighted to see their performance recognized so deservedly.

As you are undoubtedly aware, just before the November issue was distributed a reorganization was effected which resulted in all Vietnam-based units of the 315th except the 903d Aeromedical Evacuation Squadron being transferred to the 834th Air Division. The latter was recently assigned to Pacific Air Forces and Seventh Air Force from Tactical Air Command, and is commanded by Brig. Gen. William G. Moore, Jr. The 315th Air Division will continue to provide the C-130 Hercules aircraft and crews for the Vietnam Airlift. While participating in the in-country shuttle, these aircraft and crews will be under operational control of the 834th Air Division.

The members of the 315th are already working closely with those of

the 834th. I am confident that the personnel of these two Air Divisions will continue to deliver the goods as required in what is already the largest combat airlift in Air Force history.

COL. CHARLES W. HOWE

Commander

Hq. 315th Air Division (Combat Cargo) (PACAF)

APO San Francisco, Calif.

Rose's Rosy Road

Gentlemen: It was with pleasure that we at the USAF Survival School read Lt. Col. John G. Rose's article "The Rosy Road to Vietnam," December 1966. Everyone, from the Commander on down, who has read this article has reacted with praise for Colonel Rose. The most frequent comment is, "It couldn't have been done better, if we'd done it ourselves."

There is one correction, however, that I would like to make. Colonel Rose mentions that ". . . if you've not been to Survival School in the last five years, you go. . . ." This is incorrect. Air Force Manual 36-11, para. 4028b, and AFR 53-28 indicate that a crew member is not required to repeat the Survival Course.

Aside from this small error, Colonel Rose's article is beautiful.

1ST LT. PETER J. ANDERSON

Chief, Information Division

Hq. 3636th Combat Crew Training Group (Survival) (ATC)

Fairchild AFB, Wash.

Gentlemen: It was refreshing to get away from the deep "think piece" and the normal serious-vein article involving weighty material and scientific-military jargon—it was refreshing to read Colonel Rose's "The Rosy Road to Vietnam."

Your magazine does a lot to keep us up to speed month after month, and a great deal of it has to come "heavy" by its nature. Rarely do we get such good salt-and-pepper seasoning as The Rosy Road.

Might not hurt to book clever and humorous souls like Colonel Rose for more frequent appearances. His was a solid, fact-filled piece—full of obvious do-good for the older gents returning to the cockpit for Vietnam

duty. But he brought a rosy attitude and bright sense of humor to his subject.

We could stand more of that.

C. E. THOMSON, JR.
Indialantic, Fla.

Writer's Suggestions

Gentlemen: . . . Your magazine, the major portion of the membership fee, is generally good. If I may, however, I'd like to make a few suggestions that I believe would improve the format:

More pictures with more action, fewer static shots of people doing little or nothing. More color. A little more life in the advertisements.

Fewer "textbook" articles, more human interest, less statistics.

More features about noncoms. Officers are important, but someone said, "Noncoms are the backbone of the Army."

Less lengthy articles. More brief news items about: air bases around the world, retired but active Air Force men, what other service organizations are doing, and more about AFA Chapter doings. Also, how about a page of jokes, cartoons, and humorous poems. Even a "pinup" once in awhile. Variety is the spice of life, y'know.

As a writer of sorts, I know it's easier to tear someone else's work apart than it is to write your own! So I hope I haven't been too critical. . . .

MSGT. HERB ADLINGTON, USAF
(Ret.)

Arlington, Calif.

CAP Anniversary

Gentlemen: Maybe it was because the President and the Vice President remembered, the Secretaries of Defense and the Air Force remembered, and the Chief of Staff of the Air Force remembered, just to name a few, that the Air Force Association thought it best not to add to the flurry of congratulations to the Civil Air Patrol. Maybe AFA just forgot . . . or would you believe that they didn't know?

I searched in vain throughout the December issue of *AIR FORCE/SPACE DIGEST* . . . but no dice . . . not even one small word! It seems AFA just
(Continued on following page)

didn't mention the twenty-fifth anniversary of CAP.

As a ten-year member of AFA, I'm disappointed. As a member of Civil Air Patrol—I'm let down. What happened?

1ST LT. JOHN R. COADY, CAP
Easthampton, Mass.

• *Sorry we skipped over the CAP anniversary. There are so many 25s coming along right now we're afraid we'll miss some others, too. In fairness, though, we didn't receive anything from the CAP to jog our memories.*—THE EDITORS

"Thud" Jockey

Gentlemen: Congratulations on your article "F-105 in Vietnam" in the October issue. It is refreshing to read about the merits and accomplishments of the greatest fighter-bomber this country has produced.

I have just returned from SEA after completing my 100 missions over North Vietnam in the F-105. And I am glad that I was in the "Thud" on all those missions. There are many reasons why, and the greatest was on August 18, 1966, when I was the first F-105 pilot to shoot down a MIG. You had three photos taken from my gun-camera film printed on page 21 in the November issue.

If we had been in any other aircraft than the F-105 my leader would probably have been shot down, and I wouldn't have been able to maneuver in such close quarters with the MIG and destroy him with a minimum of 20-mm ammo.

Many people have asked me why the F-105 hasn't shot down more MIGs than it has. Believe me, it isn't because of either the pilots or the aircraft. The pilots are all professionals in every sense of the word, and this includes their desire to go after the MIGs. The F-105 does not have to take second seat to any aircraft. It can take a maximum of punishment and still survive. Also, as an advertisement of another aircraft indicates, "Beware, don't bother the F-105, it can turn on you," and I mean at close quarters with the Vulcan cannon. If Sidewinders were carried, the F-105 could throw those around, too.

The main reason is that the F-105 is, as written in the article, "the backbone of the Air Force effort against the North." [Its] primary duty is to place ordnance on designated targets, and they have been doing that with perfection every day. This is done in areas where AAA, SAMs, and MIGs make it almost impossible to survive. The F-105 can accomplish this mis-

sion with such speed and maneuverability that it astounds not only other fighter pilots but also leaders.

Then why such losses? First, the public doesn't read how many sorties were flown compared to losses, what was accomplished by the F-105s, what were the enemy defenses in the target area, how few other type aircraft flew against the same target. The public only hears how many F-105s were shot down. Second, my comment is, "When you play with the big boys, you are going to get hurt sometimes," and when other type aircraft take over the F-105 duties, if ever completely, they, too, will be hurt.

Don't get me wrong that the F-105 is the only fighter we have. Every one and type are necessary and can accomplish their assigned roles in an outstanding manner. My comment is that the F-105 has not been getting a "fair shake," and it will take the historians to tell that the F-105 is one of the greatest fighter aircraft in the United States, past or present.

If I am required to complete another tour in SEA I would request and be proud to fly the "Thud" again.

MAJ. KENNETH T. BLANK
Nellis AFB, Nev.

3d Air Division History

Gentlemen: I am writing my Ph.D. dissertation on the history of the 3d Air Division in World War II. I would appreciate any reader's help in putting together the story of this important aspect of the air war from 1942 to 1945. I am interested in all facets of the 3d Air Division history, including all combat and support units under its administration. Any correspondence, unit histories, memoirs, or reminiscences would be a great help.

MAJ. PAUL A. WHELAN
6117 Westminister Pl.
St. Louis, Mo. 63112

UNIT REUNIONS

39th Bomb Group, 314th Wing

I am trying to locate as many members as possible of the 39th Bomb Group (VH), 314th Wing, Twentieth Air Force, which served on Guam in 1945. Purpose is the hope of organizing a reunion. Please contact

Col. Anthony Quesada, USAF (Ret.)
Drake College of Florida
1401 East Broward Blvd.
Fort Lauderdale, Fla. 33301

384th Bomb Group

The first reunion of the 384th Bombardment Group, Eighth Air Force, is now being planned. The event is scheduled for April 14-16, 1967, at the New York Hilton. Since no up-to-date mailing list is available, would appreciate having all 384th veterans contact

Charles H. Roche
384th Bomb Group Reunion
P.O. Box 1942
Ft. Washington, Pa. 19034

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In the next 8 hours, it made the trip and aviation history. The tough birds were born!

Since that time a lot has happened: For those who wanted the durability of a regular Commander but with more room, we built the Grand Commander.

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For full information about any Commander, drop a card to Aero Commander, Government Marketing Dept., Aircraft Divisions, Rockwell-Standard Corp., Suite 810, Madison Bldg., 1155-15th St., N.W., Washington, D.C. 20005. Ask for a flight in an Aero Commander.

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Aero Commander
The tough birds from Rockwell-Standard



AIRPOWER in the news



By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

Hanoi Manages Our News

WASHINGTON, D. C., JANUARY 10

The most important matter before the nation as the 90th Congress convenes today is the war in Vietnam. And the most important aspect of that war is our utilization of airpower.

Most recent reports from the theater reiterate that it is airpower—USAF, Navy, Army, and Marine Corps—that provides the margin against defeat and probably will provide the victory. This is known in Hanoi as well as it is in Saigon and Washington.

Let there be no doubt about it. The recent wave of Communist-inspired propaganda, misrepresenting the true nature of our use of airpower in North Vietnam, grows out of our success. Hanoi, said a diplomat on duty at the United Nations, knows "that your bombing program is severely restricted. They must be asking themselves what it will be like if you really let go and attack forbidden targets like Haiphong."

Hanoi has other problems. There is growing turmoil in China. A new American offensive is under way in South Vietnam. Combined, these events mean that North Vietnam must reassess its entire role in the war. More troops sent south face almost certain defeat, even if it is possible to keep them armed, clothed, and fed. The threat of Chinese intervention, if it ever appeared real, no longer can be used as a deterrent or even an argument before the Senate Foreign Relations Committee.

There is a tendency to date the Hanoi propaganda effort from the Christmas dispatches to the New York Times of

Harrison E. Salisbury, a *Times* assistant managing editor. The truth is that Mr. Salisbury was more than a month late in recounting the statistics and descriptions as given out by the Communists.

The *Times* editor is the first American journalist admitted to North Vietnam. His newspaper has been a constant critic of American policy in this war, and it seems clear that he was selected by Hanoi because he provided an excellent channel of communication. The columnist Walter Lippmann has said Mr. Salisbury's reports are news only because they were published in the *Times*.

Mr. Salisbury's first account, dated December 25, went into detail about the air raids on Namdinh, fifty miles southeast of the North Vietnamese capital. He had been taken on a conducted tour of the city and shown what the Communists said was damage to civilian areas, caused by American bombs. If the reporter harbored any skepticism about what he was shown and told, that was not made clear in the dispatch.

The first *Times* report carried statements and statistics obviously provided by the Communists, but included in the story without attribution. Some of the material was clearly in error, such as the blunt assertion that the United States never had named Namdinh as the site of military targets. Strikes on the area had been announced last spring. Also included was the statement that a dike on the Dao River had been a target. It had not been a target. What Mr. Salisbury had not been shown were the military targets adjoining the dike.

This account, followed by numerous other Salisbury dispatches, caused great discomfort in Washington. The Pentagon, the State Department, the White House, and even the sparsely populated areas of Capitol Hill soon were reverberating. The Administration was accused of hiding the fact that it is possible the Communists were right and that eighty-nine civilians were killed in the course of more than fifty raids on military targets in the area of Namdinh, a city of 90,000 inhabitants.

The fact that reporter Salisbury was not shown the military targets and the city's heavy anti-aircraft installations was beside the point. In reacting, the Defense Department did not distinguish itself. It released no pictures, as it did of the missile sites in Cuba when its credibility was challenged in 1962. It reiterated the truth that the air war against North Vietnam is restrained, that only military targets are selected—with four major ones in Namdinh—that the pilots have obeyed their orders, and that it is impossible to avoid all damage to civilian areas.

One of the things the Defense Department did not openly announce is that the essential ingredients of the Salisbury report from Namdinh were part of a Communist press release handed out in Moscow in early November. This Hanoi version of what happened at Namdinh, complete with the exact figures, street names, dates, aircraft, and bomb types recited by Mr. Salisbury, was distributed at a press conference by the North Vietnamese ambassador to Russia.

(Continued on page 15)



—Reprinted by permission from the Washington Evening Star

Speaking of Civilian Casualties . . .



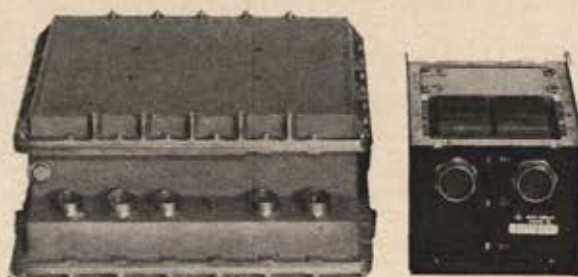
We've figured how to boost the thrust of present-day rockets without using additional propellants. RENE, an air-augmentation concept developed by Martin in conjunction with the Air Force, combines atmospheric air with rocket exhaust to achieve a remarkable increase in efficiency. Possible applications: air-to-surface missiles, sounding rockets, short-range defense suppression missiles, large space launch and weapons systems. Expected results: bigger payloads, delivered over larger range with greater efficiency. RENE is only one of several promising air-augmentation concepts being studied by Martin.

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a family of general-purpose
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are reliable; modular in design;
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and can be tailored for a specific
application on a short delivery
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North American Aviation  Autonetics Division

The document is a twelve-page "Report on U.S. War Crimes in Nam-Dinh City." It carries the imprint of the "Committee for the Investigation of U.S. Imperialists' War Crimes in Viet Nam of Nam Ha Province" and is dated October 1966. It appears to have been accepted by US reporters in Moscow—including those of the New York *Times*—for exactly what it is: Communist propaganda.

This is not surprising, but the Defense Department's reaction when it obtained a copy of the report on "war crimes" is not easily explained. The Hanoi paper, freely distributed in Moscow, was marked "classified" by the Pentagon.

A couple of examples will suffice to show that the October report, prepared in Hanoi and distributed in Moscow, contains startling parallels with the Salisbury account from Namdinh.

He wrote of a raid that damaged buildings on Hang Thao or Silk Street:

"Almost every house on the street was blasted down on April 14 at about 6:30 a.m. just as the factory shifts were changing. Forty-nine people were killed, 135 were wounded on Hang Thao, and 240 houses collapsed. Eight bombs—MK-84s—accomplished this."

The October report from Hanoi also speaks of Hang Thao, but points out that seven reconnaissance flights were carried out over the area in previous months. Then it covers the April 14 raid:

"At 6:30 a.m., when those who had just come back from a night shift were still sleeping, those who were about to work were having breakfast . . . two US planes . . . furtively intruded . . . dropped eight MK-84 bombs killing forty-nine people . . . wounding 135 people, and destroying 240 houses. . . ."

In another account, Mr. Salisbury told of a raid that hit Hoang Van Thu Street, formerly the Chinese quarter, on May 18:

"This attack they say was carried out by two F-4Hs from an altitude of about 1,800 feet at 11:04 a.m. in heavy rain, which had flooded many raid shelters. Casualties were put at thirteen dead, including a number drowned, and eleven wounded, and 372 houses were listed as destroyed. Only 230 of the normal population of 7,858 remained in the street, the others having been evacuated."

From the October version prepared by Hanoi:

"A month after the air raid on Hang Thao Street, on May 18, 1965, US aircraft attacked Hoang Van Thu, populous street next to it [sic]. Hoang Van Thu Street was formerly called the Chinese quarter . . . with 7,856 [sic] persons. . . . On May 18, there remained in the street only 230 persons. At 11:04 a.m., when the population was either lunching or resting and when it was raining heavily, the street was flooded and water filled up all air raid shelters. . . . Two F-4Hs flying at a 600-meter altitude sneaked in and dropped eight thin-shelled bombs . . . thirteen persons killed and eleven wounded."

The Hanoi version gave the names of a Mr. Duc and a Mr. Hung, who were among the drowning victims mentioned by Mr. Salisbury.

Of greater real import than the Salisbury account of what he saw and heard on his conducted tour of Hanoi and its environs is an interview he had on January 2. The *Times* reporter was welcomed by Premier Pham Van Dong. The meeting created a flurry in Washington, because it included a discussion by the Premier of the four points Hanoi has laid down for ending the war. Mr. Salisbury listed them for his readers:

"Recognition of the independence, sovereignty, unity,

and territorial integrity of Vietnam, and the withdrawal of United States forces from the area; pending reunification of Vietnam, respect for the military provisions of the Geneva agreements barring foreign forces; settlement of South Vietnam's internal affairs by the South Vietnamese under the guidance of the national liberation front, and peaceful reunification of Vietnam by the peoples of North and South without foreign interference."

Then, he continued:

"The Premier stressed that the four points were not to be considered as 'conditions' for peace talks. He described them as providing a 'basis of settlement of the Vietnam problem.'"

There was immediate speculation in the US capital that Premier Dong was trying to deliver a message. Washington already had rejected his four points. Was he saying he would not insist on them as a prelude to negotiation? Some Washington officials were ready to hail a "significant change" in Hanoi's approach. The Administration remained cool; it would welcome a change, but Hanoi now must clarify its position.

Two days later, on January 6, the Johnson Administration let it be known that the hopes stirred by Mr. Salisbury were not warranted. By this time officials recognized that Premier Dong's words were what the *Times* called "part of a concerted campaign to get the United States to halt its air attacks on North Vietnam unconditionally without any substantive concessions from the enemy." It added that officials in Washington "do not discern any signals that Hanoi wants to begin serious peace talks."

Certainly this was supported by the facts that could not be seen by an escorted reporter in Hanoi. The infiltration of North Vietnamese into the South continued at a good pace and there was no slackening of the war.

To the credit of the *Times*, it must be added that the newspaper's competent military editor, Hanson W. Baldwin, was given space in the midst of the Salisbury imbroglio to voice a dissenting opinion. Mr. Baldwin summarized the military facts. He pointed out that the bombing in the North is both effective and restrained. A minimum of civilian damage and death is inevitable, and the bombings have saved the lives of many soldiers and marines on the ground. If Hanoi can portray the war as an unlimited assault on innocent civilians, "the Administration and the Pentagon have only themselves to blame."

He added this pertinent point:

"Distorted, confusing, or contradictory statements in Washington, inflated claims and undue secrecy in the Pentagon, having aided enemy propaganda. Many uniformed officers in Washington, in Hawaii, and in Saigon have advocated policies of far greater frankness about details of the bombing."

"Weeks and months ago some urged the issuance of explanations about civilian casualties and residential damage, but they were overruled by their civilian superiors."

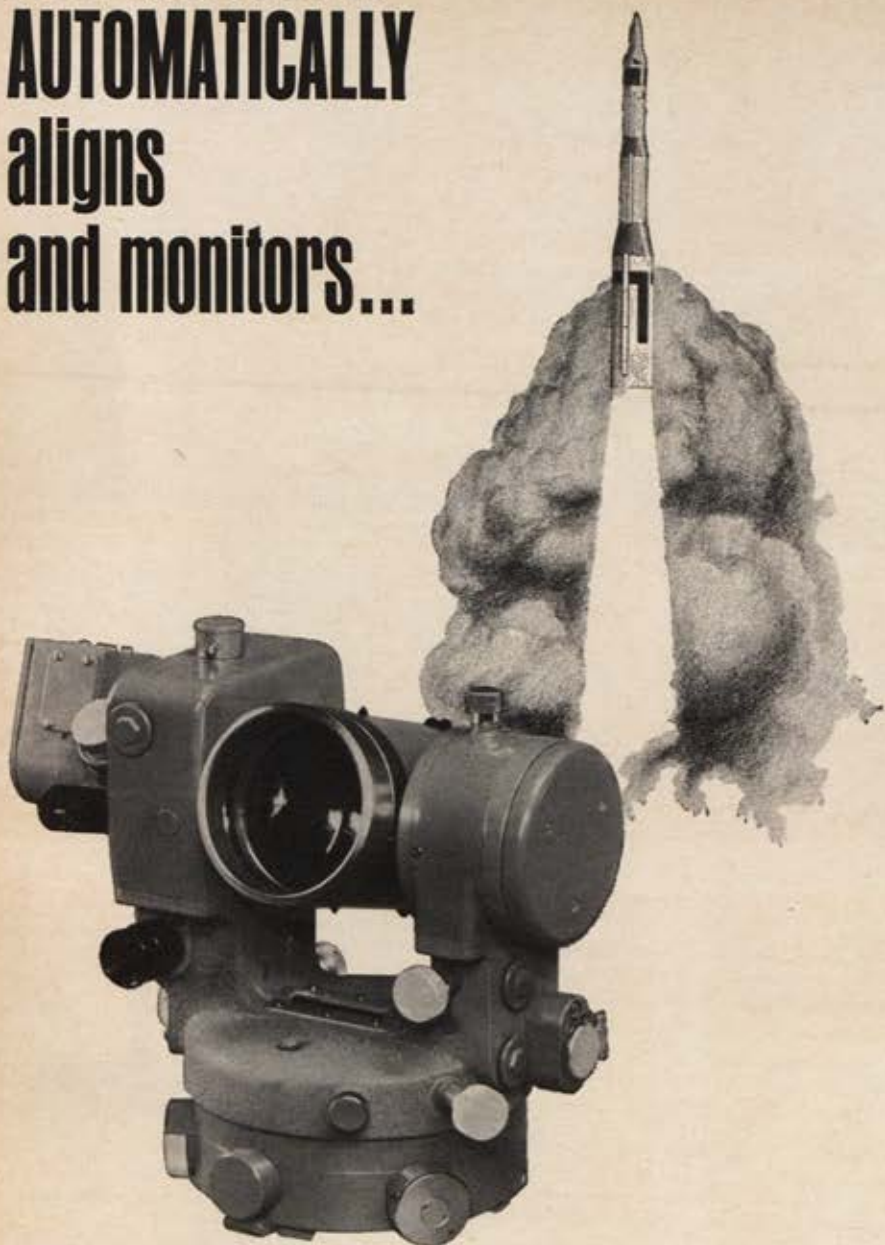
There are a number of other observations that cannot be omitted:

1. Hanoi alone decides which American journalists will be admitted to North Vietnam. Many have applied. The ones who go will be those most likely to express the Hanoi story, least likely to ask questions about North Vietnam's outrages and its responsibility for terrorism and war in South Vietnam.

2. The Administration in Washington is helping Ho Chi Minh's regime manage the news in a way that will be envied in many capitals. The simple classification of the Hanoi report on Namdinh after it was distributed in Mos-

(Continued on following page)

New theodolite AUTOMATICALLY aligns and monitors...



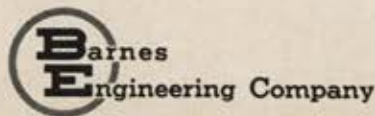
When optimum alignment and calibration of sophisticated systems are demanded, this new theodolite will do the job — and *automatically* monitor as well.

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In either single or dual axis mode, this new *automatic* theodolite provides continuous, long term monitoring of system alignment to 0.05 second of arc.

This unique instrument has been selected for precise system alignment and calibration both at the launch site and in the laboratory. Typical applications are inertial guidance system alignment, antenna orientation, and precision alignment of optical systems.

For additional information, write to: Electro-Optical Products, Barnes Engineering Company, Stamford, Connecticut 06902.



AIRPOWER ————— CONTINUED

cow was an error of first magnitude. If it had been promulgated as Communist propaganda at least one of Mr. Salisbury's stories would never have been in print.

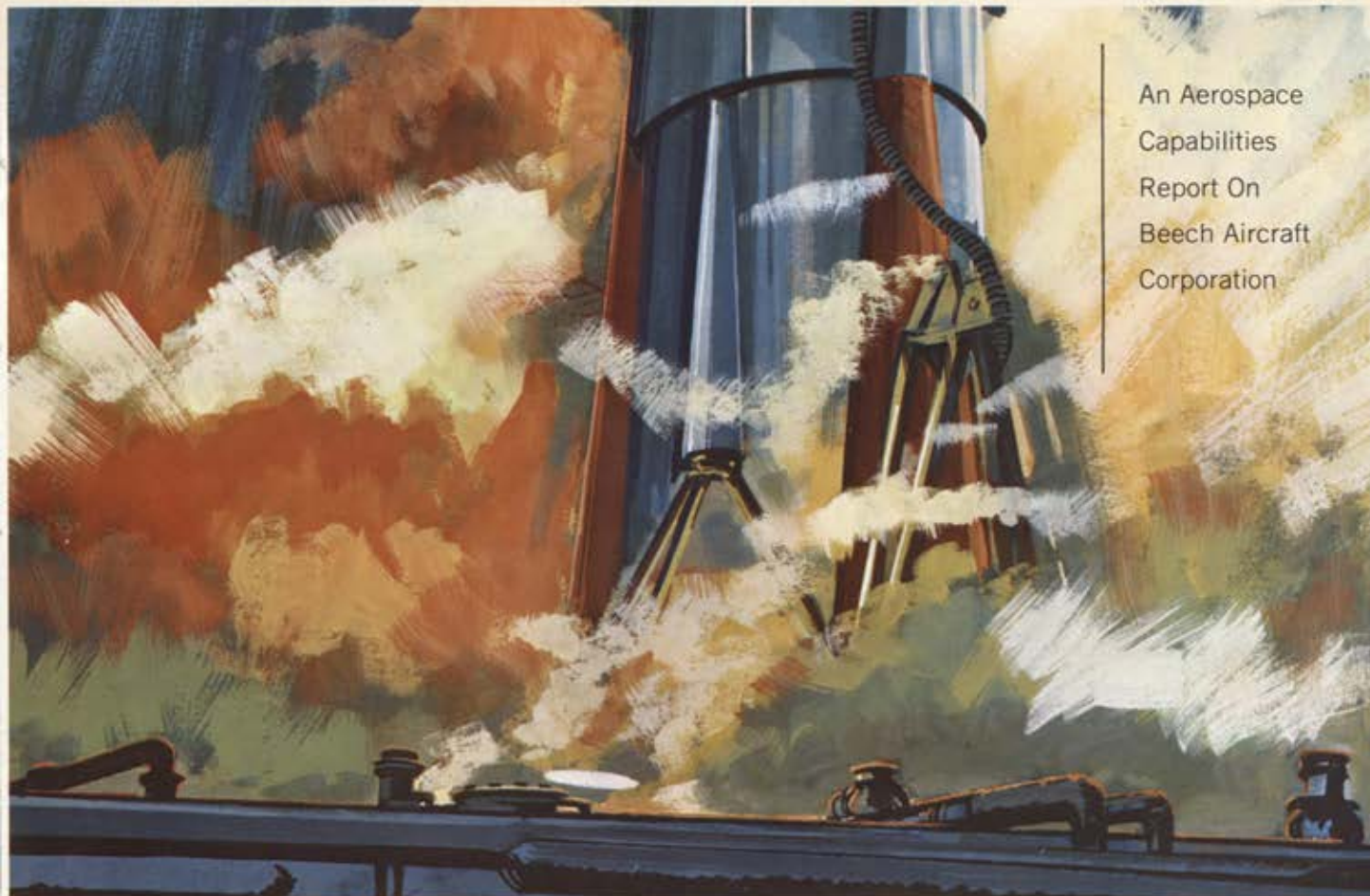
3. If other American reporters are admitted after passing the strict Hanoi standards that it requires of its visitors with typewriters, what they write will continue to harass the Administration. It is significant that both the doves and the hawks of our domestic debate have utilized the Salisbury material. The doves, of course, accept his implication that the United States is carrying on a ruthless war against innocent women and children. The hawks are capitalizing on the opportunity to attack the Administration's credibility, its management of the war, the failure to set victory as a goal, and the bad effect of all these things on the American image abroad.

4. The mania for secrecy goes far beyond the example of the Hanoi press release that was classified. There are many other details of the war in Vietnam, and other parts of Southeast Asia, that are not being openly discussed, all to the disparagement of our entire effort. The very charge of indiscriminate bombing can be offset by disclosing more facts about the techniques used in the selection and crushing of targets. There has never been a war in which precision was more important and more insistently pursued. One local paper has broken the story of Big Eye, the Constellation used as a flying control tower in the sky over North Vietnam. This has been a secret. It is there to track our aircraft, make sure they stay on course, that they do not violate borders—particularly with China—and help in the precise delivery of the bombs. The actual bombing techniques used in North Vietnam are highly hazardous—far more so than necessary—because the less dangerous ways to home on a target are less accurate. In the actual choice of targets, one of the most important considerations is the proximity of civilian installations.

Certainly the Congress that meets today in Washington has read the election results, as well as the *Times* dispatches from Hanoi. If there is anything we can say about public opinion in the United States, it is that the idea of winning the war and having it over has great appeal, but only if the war can be ended without serious compromise with the Communists.

Airpower remains a key tool to bring about the kind of peace the American people are entitled to.—
END

An Aerospace
Capabilities
Report On
Beech Aircraft
Corporation



**BEECH
IN SPACE**



FLAME ARRESTOR

HYDROGEN
VENT STACK

WHITE ROOM

GEMINI SPACECRAFT

LIQUID OXYGEN
CONTROL BOX

LIQUID HYDROGEN
CONTROL BOX

OXYGEN FILL AND
VENT LINES

HYDROGEN FILL AND
VENT LINES

LIQUID OXYGEN
CONTROL CONSOLE

LIQUID HYDROGEN
CONTROL CONSOLE

LIQUID HYDROGEN
SERVICE UNIT

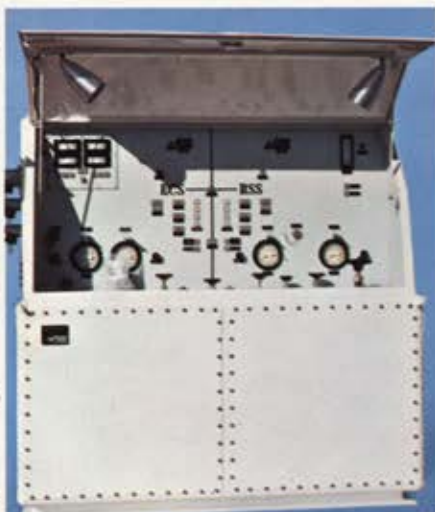
TERMINAL BOXES

LIQUID OXYGEN
SERVICE UNIT

GEMINI...

Complete systems responsibility for delivery of Liquid Oxygen and Liquid Hydrogen for the spacecraft Reactant Supply and Environmental Control Storage Systems. That's the Beech assignment on Project Gemini, under contract with McDonnell Aircraft Corporation. An examination of the various components of this Aerospace Ground Equipment system indicates the scope and range of Beech capabilities in R&D, testing, and the fabrication involved.

where Beech ground support is vital to mission success



LIQUID HYDROGEN CONSOLE



LIQUID HYDROGEN CONTROL BOX

Liquid Oxygen is brought to the launch site in a Beech designed and fabricated service unit Dewar. Instruments for precise knowledge and control of all functions such as temperature, pressure, volume and flow are provided, as is the flexible transfer line (vacuum insulated) that feeds the liquid into the terminal boxes.

Liquid hydrogen is brought to the launch site in another service unit Dewar. The cryogenic fluid Dewars are as precisely built as a laboratory instrument. Beech has designed and fabricated Dewars of up to 7,000 gallon capacity, and Dewars with a flow capacity up to 166 gallons per second (10,000 gallons per minute) for liquid hydrogen, and 2,220 gallons per minute for liquid oxygen.

Liquid hydrogen and liquid oxygen pass through Beech designed and fabricated terminal boxes to the individual control consoles. The terminal boxes are a part of the total system designed for maximum thermal efficiency...minimum cooldown mass, minimum cooldown and transfer time, and delivery of maximum density liquid to the spacecraft tanks.

The control consoles regulate the flow of liquid oxygen and hydrogen into permanent hard-line transfer sections that carry the liquids to the White Room high in the erector unit. Because of the ultra-high fluid purity requirements, the system design permits complete vacuum purging prior to the transfer operation. It also provides that a dumping sequence may be instantly initiated from the control console at any time.

Vacuum-jacketed hardline transfer sections consist of an inner fluid carrying line, a larger outer concentric line, and specially designed cryogenic end fittings. Each line section is equipped with a vacuum transducer allowing vacuum level checkout and a vacuum pumpdown port. All liquid carrying systems are vacuum insulated to meet the high transfer efficiency required.

The Liquid Hydrogen Control Box and the Liquid Oxygen Control Box are located in the launch complex White Room. These contain controls and instrumentation for the actual filling of the cryogenic storage tanks. Each contains liquid sensors which give positive evidence that the spacecraft tanks have been filled to capacity.

***Life support
and electrical
systems for
Project Apollo will
depend on Beech***



A Beech "breakthrough" in flight-weight thermal protection systems will be applied to the cryogenics storage subsystems of the Apollo spacecraft. Systems requirements of vital importance to sustained space flight include maximum storage capacity, minimum loss through "heat leak" and minimum system weight. The new Beech system, a vast improvement over original project specifications, reduces heat leak by one-half and reduces the insulation weight by 75%.

Beech responsibility includes the design, construction and testing of cryogenics storage sub-systems consisting of two hydrogen tanks and two oxygen tanks, plus all related components and controls to provide breathing oxygen to the environmental control system and provide the oxygen and hydro-

gen for fuel cells that supply electrical energy to the Apollo command module.

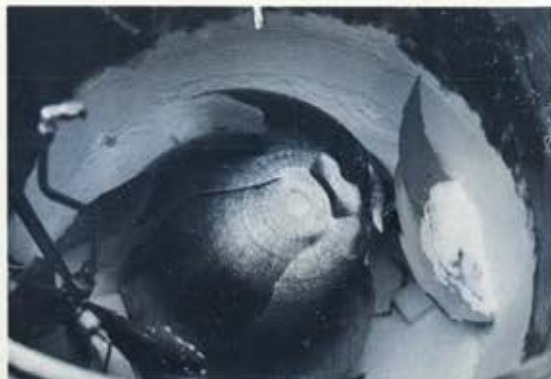
Beech's responsibility on the Lunar Excursion Module is one of the most critically demanding Aerospace Ground Equipment operations involved in Apollo—delivering over-critical liquid helium at 9°K to the LEM, where it will be used to pressurize the craft's propellant tanks to assure proper flow. Because of its extreme volatility (it boils 100 times more easily than water), and its extremely low boiling point (minus 452°F), liquid helium is the most difficult of all cryogenic fluids to handle. Size and weight limitations add to the complexity of the assignment. These limitations could not be met by methods normally used before the recent Beech "breakthrough" in flight weight thermal protection.



Beech designed and fabricated tank for liquid oxygen undergoes testing. Two of these provide a two-week supply to the Apollo Command module.



This liquid hydrogen tank, designed and fabricated by Beech, incorporates advanced thermal protection systems recently developed by Beech.

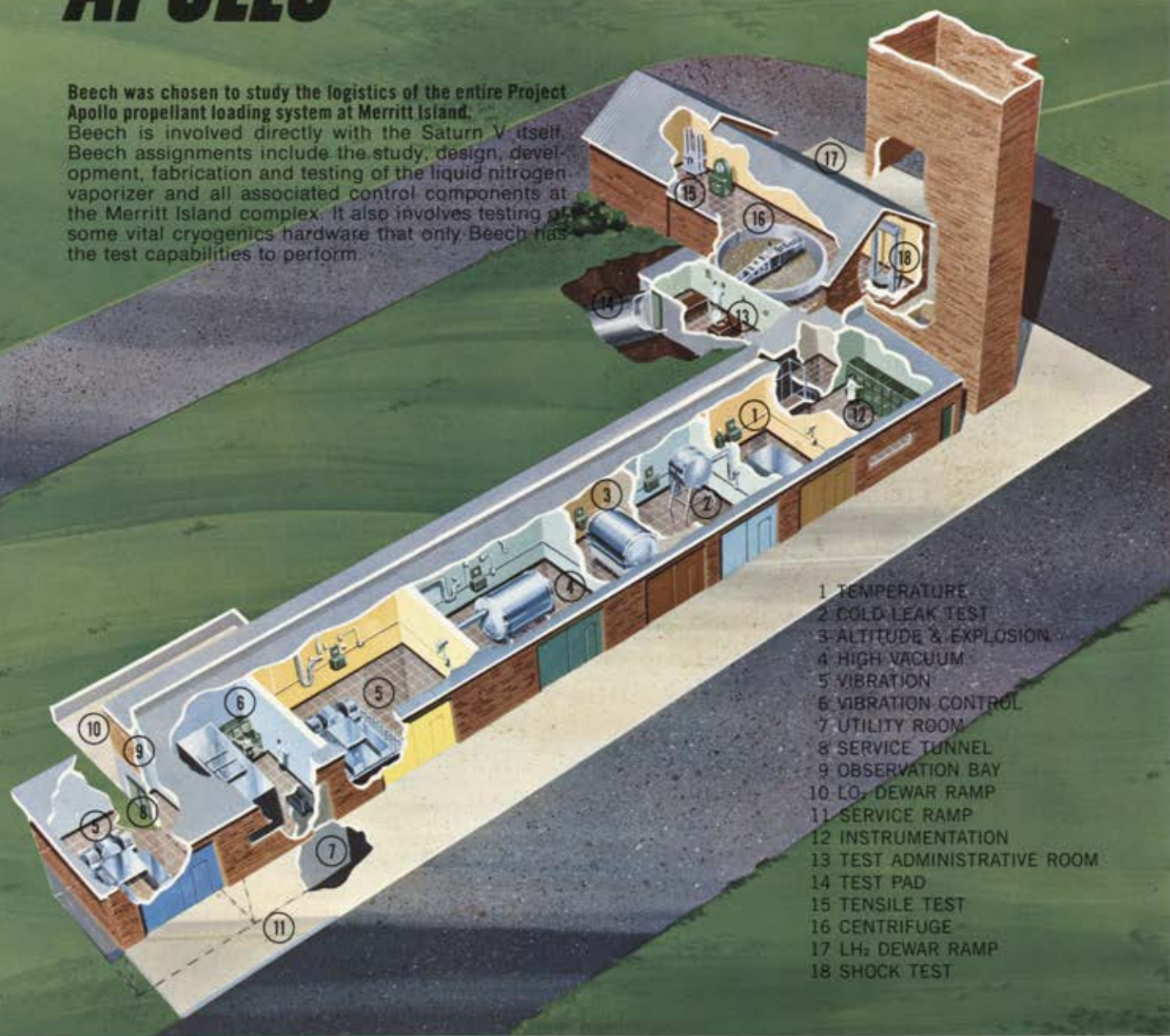


Testing to destruction helps make sure that Beech cryogenic fluid tank designs and component systems are as safe as can be made.

BEECH
TEST FACILITIES
FOR PROJECT
APOLLO

The new Beech cryogenics test complex A is especially constructed for testing cryogenics subsystems and components designed for use with liquid hydrogen and liquid oxygen. The 7,000 square feet of test area include such features as five blast-proof test cells, remote instrumentation and controls, observation bay, and service and escape tunnels. It is designed for maximum safety and to provide the latest in technology and operational efficiency.

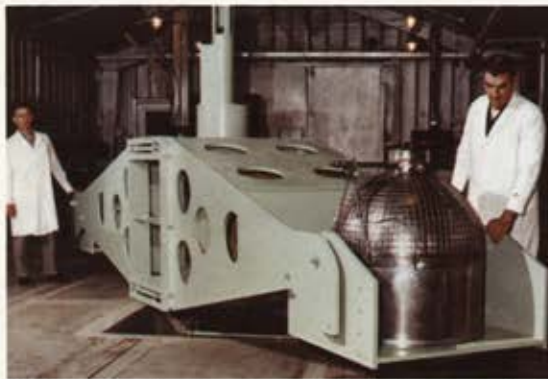
Beech was chosen to study the logistics of the entire Project Apollo propellant loading system at Merritt Island. Beech is involved directly with the Saturn V itself. Beech assignments include the study, design, development, fabrication and testing of the liquid nitrogen vaporizer and all associated control components at the Merritt Island complex. It also involves testing of some vital cryogenics hardware that only Beech has the test capabilities to perform.



- 1 TEMPERATURE
- 2 COLD LEAK TEST
- 3 ALTITUDE & EXPLOSION
- 4 HIGH VACUUM
- 5 VIBRATION
- 6 VIBRATION CONTROL
- 7 UTILITY ROOM
- 8 SERVICE TUNNEL
- 9 OBSERVATION BAY
- 10 LO₂ DEWAR RAMP
- 11 SERVICE RAMP
- 12 INSTRUMENTATION
- 13 TEST ADMINISTRATIVE ROOM
- 14 TEST PAD
- 15 TENSILE TEST
- 16 CENTRIFUGE
- 17 LH₂ DEWAR RAMP
- 18 SHOCK TEST



Every component designed and fabricated by Beech for Apollo will meet tests on the ground that are far more stringent than any they will face in the vacuum of outer space.



Beech testing is complete...and all "under one roof" at Boulder. Much test equipment used was itself designed and fabricated by Beech.



Beech is capable of testing for all hostile environments faced in outer space flight. These include vibration, high vacuum, flows, radiant temperatures and compatibility (i.e., fluid with material).

Beech has created a revolution in Flight Weight Thermal Protection to bring long-term missions

Liquid hydrogen tanks are being produced now that utilize the new Beech flight weight thermal protection system. These will be used in Project Apollo, and have already made a great contribution to the assurance of a successful 14-day space mission. To appreciate the efficiency of the new Beech system, a hydrogen storage system with a capacity of 100 pounds of usable fluid would be capable of supplying this fluid for a period of 139 days! Yet the dry weight of this system would be only 140 pounds.

Over and above the excellent thermal performance and low weight of the Beech system, other advantages that have been demonstrated are: *production repeatability*, maintained by the fact that components are prefabricated and tested before installation; easy *vacuum acquisition* provided by the small amount of material in the vacuum annulus; and *moderate cost* stemming from low assembly time. Practically all systems now foreseen will be constructed with a vacuum annulus less than 1¼ inches thick!



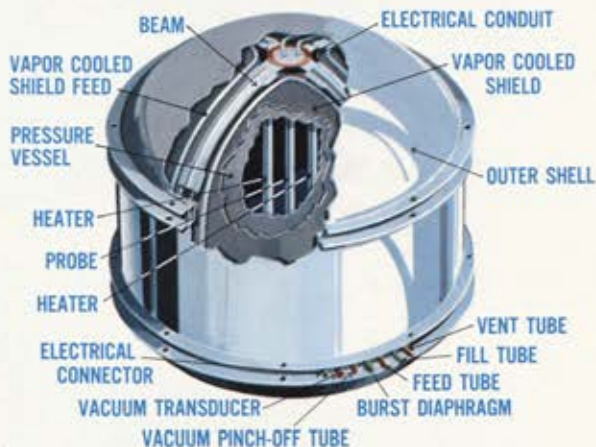


In a feasibility study of storing and feeding cryogenic fluids for electro-thermal propulsion engines to control stationary communications satellites, a hydrogen storage and feed system that fitted a 28-inch spherical envelope was analyzed. It was found feasible to deliver 20 pounds of hydrogen over a three-year space mission duration! The system weight is 42 pounds. (Shown here are part of the control and recording instruments for the environmental laboratory).



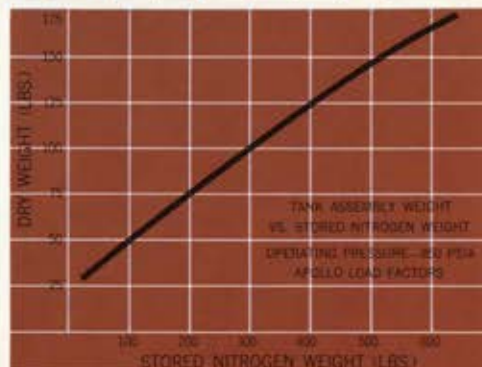
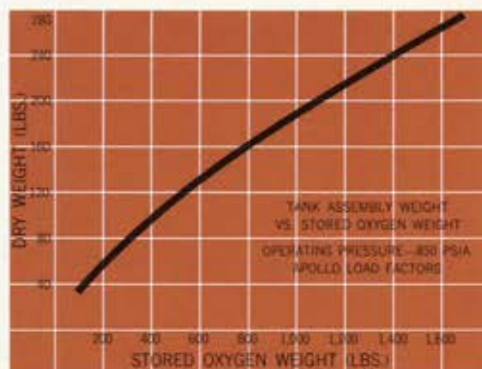
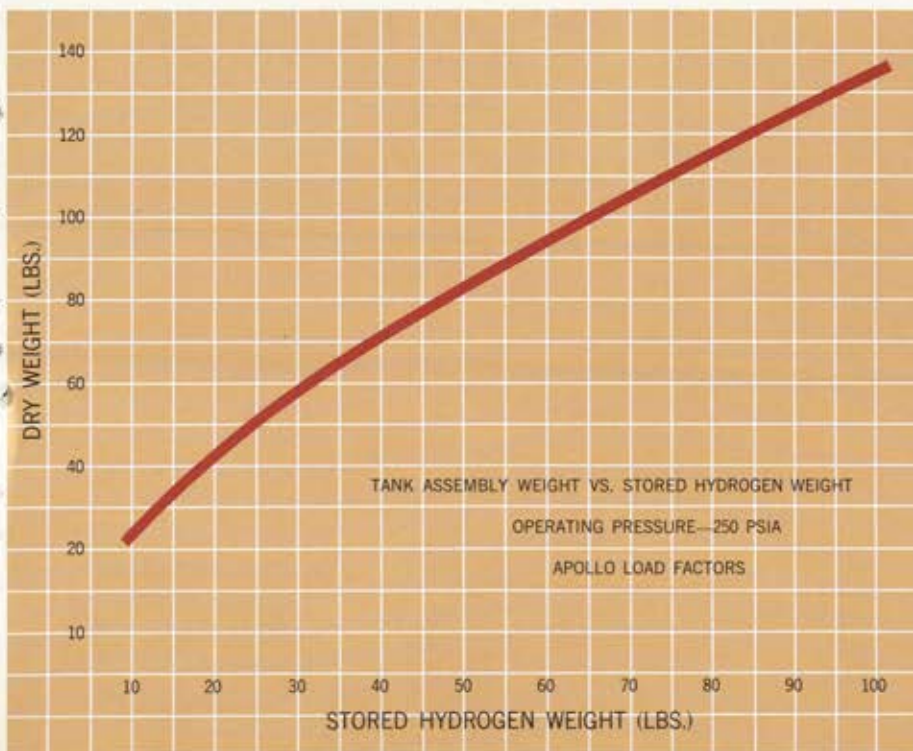
Typical of the programs for future space applications is the research to find an adequate positive expulsion system. The primary effort centers in bladders. The practical application of the new Beech flight weight thermal protection system to the cryogenic storage of helium for long-term missions brings this problem closer to solution.

closer to reality.

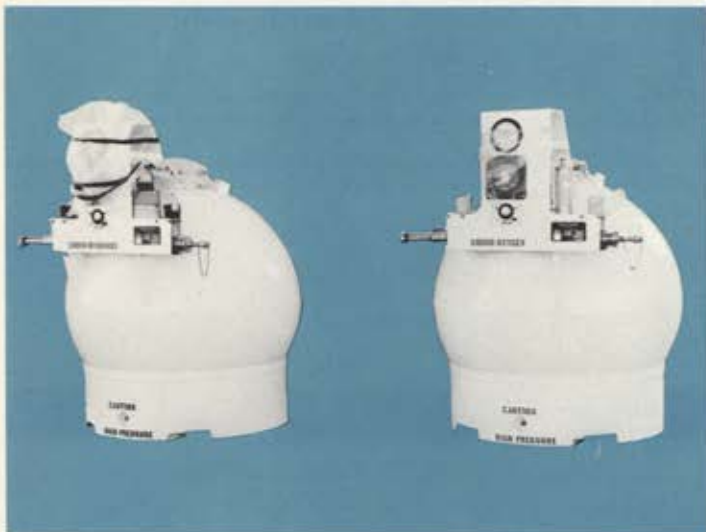


Fuel cells will convert hydrogen and oxygen into electric power and drinking water for space crewmen on post-Apollo missions. Beech flight weight thermal protection systems are capable today of providing cryogenic storage for such long mission application.

These charts depict the application of Beech flight weight thermal protection systems to typical cryogenic hydrogen, oxygen, and nitrogen tanks. Established from valid test data obtained from Beech experimental units, the values given represent the application of a system that includes structural support, plumbing, and internal tank components electrical wiring. Electrical equipment included performs mass measurement sensing, temperature sensing, fluid heating, and destratification. All units are designed to withstand vibration and acceleration loads during a typical launch phase. All weights shown are based on utilization of state-of-the-art techniques.



***Beech Capabilities
in Cryogenics
have resulted in
many uncommon assignments***



These high pressure Dewars to contain supercritical hydrogen and supercritical oxygen for ground use were designed and manufactured at Boulder. These Dewars will work at 250 and 1000-pound pressures, respectively, and are an example of the cryogenics-associated projects that Beech carries through from design to completion.



Apollo Bench Maintenance Equipment. Systems to test and functionally certify airborne components and modules of the Apollo spacecraft's Beech-built Cryogenic Storage Subsystem are built by the Boulder division. The first of these intricate equipments is installed at Cape Kennedy now.



Liquid helium for use on LEM will be stored in the Dewar being fabricated here. The shining, golden, elongated globe is the inner pressure vessel for relatively low-pressure containment of the minus 452° F. fluid. A revolutionary new Beech-developed thermal protection system, designed to integrate the inner tank suspension and insulation, combines light weight and thermal efficiency with adequate support. This new thermal protection system is primarily responsible for the reduction of the 5.8 to 1.0 equipment-weight-to-capacity ratio of other liquid helium Dewars to a startling 1.9 to 1.0 ratio.

For meeting
tomorrow's standards...

***Look to Beech
Capabilities!***

For full information about how you may take advantage of Beech's experience in systems management and proven capabilities in designing, developing, manufacturing and testing of components for aviation and aerospace projects, write, wire or phone Contract Administration, or Aerospace Marketing, Beech Aircraft Corporation, Wichita, Kansas 67201, U.S.A.

Beech Aerospace Division

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AEROSPACE WORLD

By Allan R. Scholin

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D. C., JANUARY 12
Buildup of US forces in Southeast Asia will continue, President Johnson declared in his State of the Union address to Congress and the nation January 10.

He said there are now almost 500,000 US personnel in SEA.

"I wish I could report to you that the conflict is almost over," he asserted. "This I cannot do. We face more cost, more loss, and more agony. For the end is not yet. I cannot promise you that it will come this year—or the next. . . .

"General Westmoreland reports that the enemy no longer can succeed on the battlefield. Our pressure now must be—and will be—sustained until he realizes that the war he started is costing him more than he can hope to gain.

"I know of no strategy more likely to attain that end than the strategy of accumulating slowly, but inexorably, every kind of material resource. . . .

But he seemed to rule out any intensification of attacks against North Vietnam—or did he?—in these words:

"Whether we can fight a war of

limited objectives over a long period of time, and keep alive the hope of independence and stability for people other than ourselves; whether we can continue to act with restraint when the temptation to 'get it over with' is inviting but dangerous; whether we can accept the necessity of choosing 'a great evil in order to ward off a greater'; and whether we can do these without arousing the hatreds and passions ordinarily loosed in time of war; on these questions so much turns."

Meanwhile, he said, the US welcomes peace-seeking efforts by the United Nations and others, "and we will continue to take every possible initiative ourselves to probe for peace.

"Until such efforts succeed, or until the infiltration ceases and the conflict subsides, we must firmly pursue our present course. We will stand firm in Vietnam."



Of nine astronauts booked for the three manned Apollo missions NASA has scheduled for 1967, seven are Air Force pilots and another a former ANG flyer. USAF Lt. Col. Virgil (Gus) Grissom, making his third spaceflight,

commands the first crew in flight AS-204, now expected to go about February 21. With him will be Air Force Lt. Col. Edward H. White, II, who flew in Gemini-4 in June 1965, and Navy Lt. Cmdr. Roger B. Chaffee on his first space mission.

NASA is inaugurating an "open-end" mission philosophy with the first Apollo flight. Once in orbit, the mission can run from three hours to fourteen days, depending on how well the spacecraft and crew are doing.

After that will come an unmanned mission, AS-206, marking the first flight test of the lunar excursion module (LEM). If LEM checks out okay, the second manned mission will follow sometime this summer.

That will be a two-phase operation, AS-205/8, with the launch of the
(Continued on page 29)

Weighing almost 9,000 tons, Apollo launch complex—spacecraft, booster, and portable tower—moves from checkout facility to launch pad on giant transporter at Kennedy Spaceflight Center, Fla.



Crew for first manned Apollo mission scheduled for late February includes USAF Lt. Col. Virgil Grissom, center, command pilot, and Ed White, left, with Navy Lt. Cmdr. Roger Chaffee.



Mud, snow, jungle—bombed bases, mountainous terrain or runways—all are in the operational environment of the US/FRG tactical fighter now in the design phase.

For this will be the most advanced V/STOL any-terrain flight system ever undertaken.

The selection of Fairchild Hiller's Republic Aviation Division and the West German firm of Entwicklungsring-Sud (EWR) was the result of exhaustive evaluation of top United States and German capabilities in vertical and short take-off and landing technology.

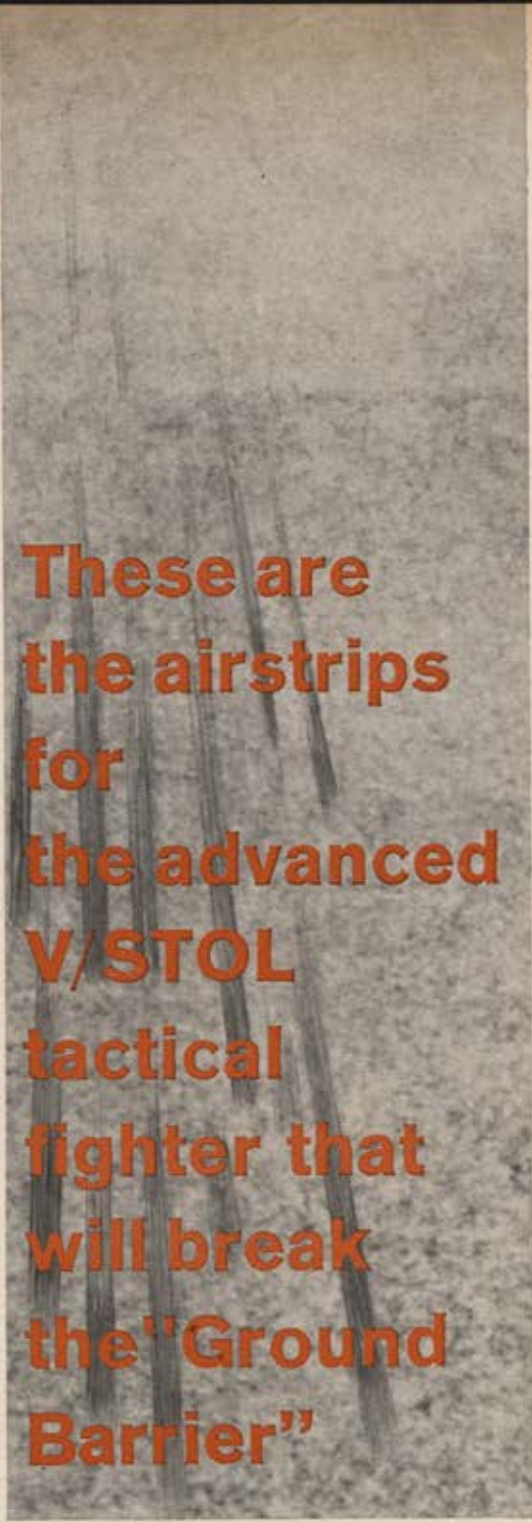
These joint capabilities include millions of engineering man-hours directed toward breaking the "ground barrier" without sacrifice of speed, range, or payload.

The joint-nation decision is a historic one, commencing a new chapter in the history of flight.



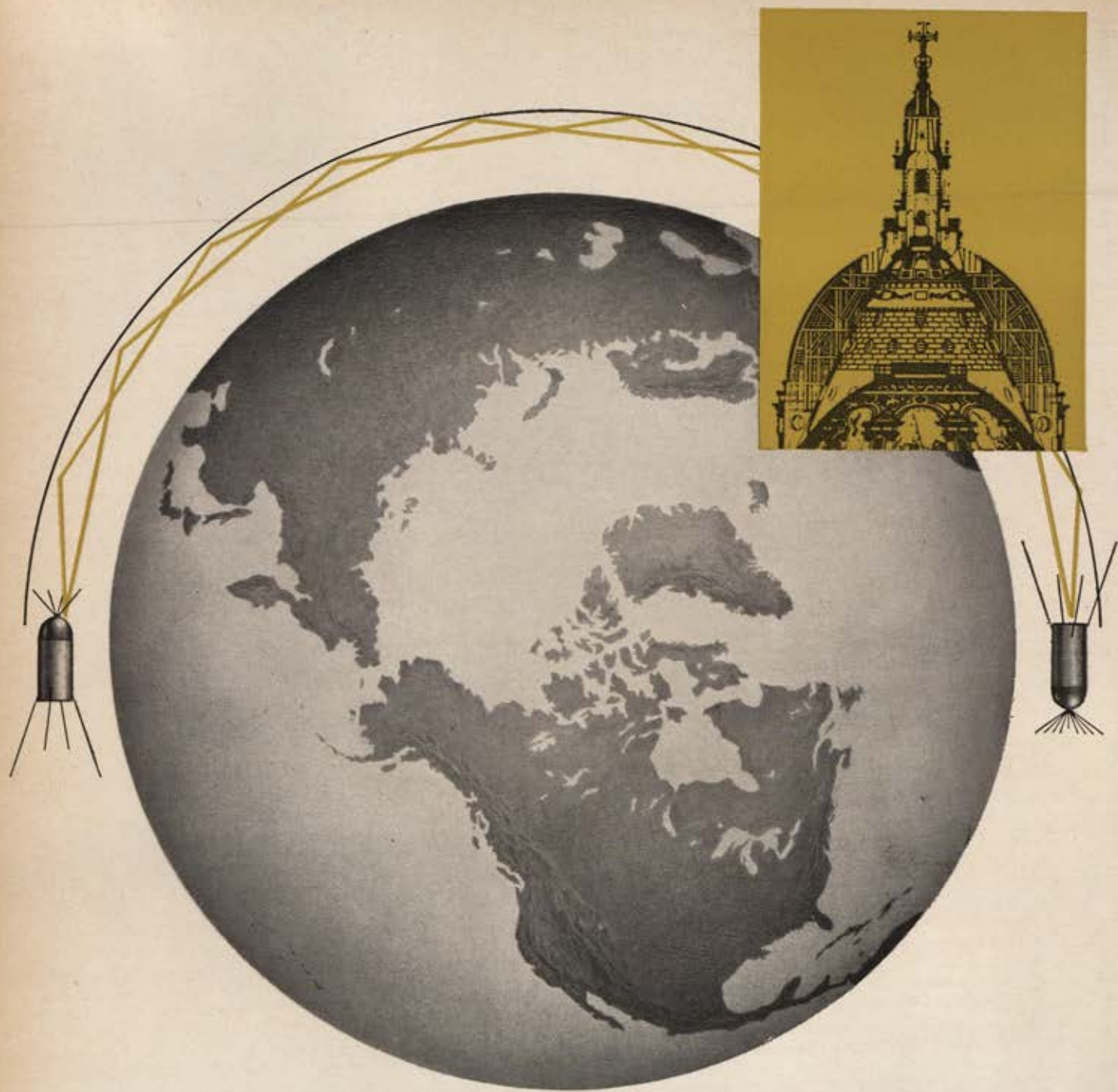
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Earth's ionosphere may become "whispering gallery" for radio waves

The acoustic "whispering gallery" effect, first proved by Lord Rayleigh a century ago in London's St. Paul Cathedral, may soon have its radio wave parallel in the lower ionosphere.

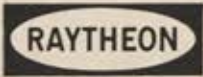
Two satellites — designed and built by Raytheon under Air Force sponsorship — have been launched to conduct the experiment.

The results may have an impact on many long-range, reliable communications systems such as multi-spacecraft communications networks and global-scale command and control.

This experiment is typical of the advanced thinking that forms the basic ingredient of Raytheon's total systems capability. For additional information, contact: *Manager, Advanced Program Development, Raytheon Company, Space & Information Systems Division, 528 Boston Post Road, Sudbury, Mass. 01776; Tel: (617) 443-9521.*



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WORLD CONTINUED

three-man crew in AS-205 to be followed a day or so later by AS-208 with an unmanned LEM. Command pilot in AS-205 will be USAF Lt. Col. James A. McDivitt, who commanded Gemini-4. His crew members will be Air Force Lt. Col. David R. Scott, module commander, who flew in Gemini-8 early in 1966, and Russell Schweikart, on his first space mission. Now a NASA civilian, Schweikart was formerly a captain in the Massachusetts Air Guard.

After docking with the LEM, Colonels McDivitt and Scott will enter the LEM to check out its control systems while linked with the Apollo. Then they'll return to Apollo, separate from the LEM, and return to earth.

Launch vehicle for these missions will be the Up-rated Saturn I, formerly designated Saturn IB.

Next are scheduled two unmanned tests of the massive three-stage Saturn V booster, designated AS-501 and AS-502. If the Saturn V systems are satisfactorily flight-tested in these two missions, NASA will move on to the third manned flight of the year in AS-503. In that mission, the entire moon-flight package of Apollo spacecraft and service module and LEM will be launched atop the Saturn V into an earth orbit with a 4,000-mile apogee.

Col. Frank Borman, command pilot of Gemini-7, will command the all-Air Force AS-503 crew, joined by Lt. Col. Michael Collins, veteran of the Gemini-10 mission, and Maj. William A. Anders, making his first space-flight. They will simulate the entire lunar mission, performing the same sequence of actions at the same relative times.

After one or two additional manned missions in 1968 to iron out whatever difficulties are encountered by Colonel Borman and his crew, the actual lunar flight could take place before the end of that year.



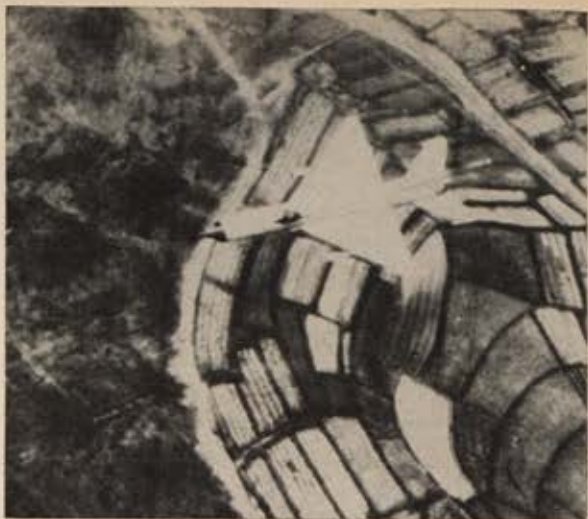
An old adversary is reported to be back in action against US pilots over North Vietnam. If so, he's having no more success than before.

The old foes are pilots from North Korea, who are said to have volunteered to fly MIG-21 interceptors for North Vietnam. Without them it is unlikely that the North Vietnamese Air Force could use the large number of MIGs recently furnished by the USSR. The Soviets are training North Vietnamese pilots, but the known graduation rate is not yet sufficient to match their expanded inventory.

Arrival of the North Koreans may
(Continued on following page)



North Vietnamese MIG-21 interceptor photographed near Hanoi. Absence of data about camera plane in USAF release, together with relatively fuzzy quality of photo, suggests it may have been taken by high-flying U-2.



Mission Success with Collins All-Weather Systems

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With Collins AL-101 Radio Altimeter and associated navigational receivers, these three-dimensional Flight Directors give military aviation its most advanced approach to all-weather logistic operations. A human-engineered V-Bar indicator presents positive steering commands from takeoff to touchdown. The system provides a constant visual picture of aircraft attitude and position. The 3-D concept eliminates parallax.

More than 50 airlines and most Category I general aviation aircraft are using the Collins system now. It will enhance your probability of mission success.

COMMUNICATION/COMPUTATION/CONTROL



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have prompted the North Vietnamese to send up a large force of MIGs to oppose USAF F-105 fighter-bombers attacking SA-2 missile sites in the Red River Valley northwest of Hanoi on January 2. But when the MIG-21s rose through an overcast, they found USAF F-4C Phantom IIs waiting for them.

The locale may have been different from MIG Alley of Korean War days, but the result was the same. When the fight ended about fifteen minutes later, seven MIGs had been shot down by USAF Phantoms, led by Col. Robin Olds. The US lost none.

It was the biggest single air victory of the war for the US, bringing the total of MIG kills to thirty-four for US pilots, including eight destroyed by Navy aircrews. The US has lost ten planes to MIGs, most of them F-105s hit before they could get rid of their bomb loads.

The victory, according to Lt. Gen. William W. Momyer, Commander of USAF's Seventh Air Force in Vietnam, was the result of "changed tactics." But in Washington, a DoD

spokesman insisted that the air battle represented no change in basic US policy, declaring only that "We had a good day."

Whatever the tactics, they prompted North Vietnam to avoid further large-scale air encounters for the present, and perhaps to reassess the combat skill of their new volunteers.

Hanoi has long declined to accept volunteers from Red China, primarily because it doesn't want its powerful neighbor to gain a foothold in guiding its military affairs. The North Koreans, with no designs on Hanoi, were apparently more welcome. And, with South Korea contributing some 45,000 troops to the ground war in Vietnam, North Korean leaders hoped to gain some propaganda value out of sending pilots to North Vietnam. As of January 2, both the North Koreans and North Vietnamese may be entertaining strong misgivings.



With no comparable follow-on bomber yet in view, the Air Force has embarked on another attempt to



Development of automatic controls to alleviate severe stresses encountered in low-level flight is goal of LAMS project being conducted by Flight Dynamics Lab at Wright-Patterson AFB, Ohio.

stretch the useful life of its B-52s, contracting with the Boeing Company for a research project to develop an automatic control system which will reduce in-flight structural stresses and strains, particularly at low level.

Called LAMS, for Load Alleviation and Mode Stabilization, the program is being conducted for USAF's Flight Dynamics Laboratory at Wright-Patterson AFB, Ohio, by Boeing's Wichita, Kan., division. The system is intended to automatically cushion the effects of flying in turbulent air or of abrupt corrective control maneuvers made by the pilots or autopilots.

A fifteen-foot-long boom on the nose of the test B-52 will measure wind gusts that buffet the airplane. Sensors are being installed on structural members of the fuselage, wings, and tail surfaces. Gyros in the aircraft will sense forces being applied, and the system will automatically apply controls in an opposing direction. For example, in flying through turbulence which would create a twisting motion on the airplane, the automatic controls would neutralize the twisting energy without overcorrecting.

Robert B. Johannes, program manager for the Flight Dynamics Lab, said the goal is to extend aircraft life by seventy to 100 percent. Besides increasing structural life of the plane, the smoother ride is expected to improve crew efficiency, particularly on high-speed low-level flights, and provide a more stable weapons delivery platform.

Earlier measures to lengthen the life of B-52s included an extensive modification program to strengthen wings and tail surfaces for low-level

operations, and a sharp reduction in the number of B-52s on air alert ordered last spring by Secretary of Defense McNamara.



A national committee headed by Maj. Gen. Jack Catton, Director of USAF Aerospace Programs, has urged a coordinated federal effort to overcome the dangers to civil and military aviation of clear air turbulence (CAT).

The effects of clear air turbulence can be as severe as those of violent thunderstorms, but CAT is almost impossible to detect visually before the aircraft flies into it.

The group listed six priority operational needs for the program, in this order: airborne and ground-based CAT detection, improved forecasts, improved reporting and alerting systems, establishment of aircraft design criteria, pilot-machine response in turbulence, and flight manuals and/or publications on CAT's seasonal and geographical occurrences.

Its report was delivered to Dr. Robert M. White, Administrator of the Environmental Science Services Administration (ESSA) and Federal Coordinator for Meteorological Services and Supporting Research.

Development of an in-flight advance warning detector "will do more to solve the CAT operational problems than any other single thing," the committee reported. It attached nearly as much importance to development of a ground-based system.

The report found that costs for military aircraft lost and damaged by CAT over a three-year period from 1963 to 1965 were estimated at \$30



Second of two Intelsat communications satellites, like those shown here being tested by Hughes engineers, was to be launched in mid-January into stationary Pacific orbit. First satellite was damaged during launching.

million. "CAT has affected peacetime and cold-war operations, and has a large potential for causing degradation of wartime activities," the report stated.

In civil aviation, an estimated \$18 million loss occurred in 1964 alone, it said. Aviation growth, and particularly the advent of the supersonic transport in the next decade, will make the problem even more acute.

The committee found that, although
(Continued on following page)

NEW BOOKS IN BRIEF

Aviation: The Creative Ideas, by Oliver Stewart. With the help of diagrams and photographs this book delves into the origins and highlights of aeronautical progress and the men responsible. Frederick A. Praeger, N. Y. 144 pages. \$7.50.

Bombers, Boomers and Buttons, by Bill Hughes. A cartoon sketchbook about the Strategic Air Command, its history, its people, and its humor. PEX Publishing, Box 3214, Omaha, Neb. 68103. 94 pages. \$1.25.

Condition Green: Tokyo, by Neil Goble. A novel based on what could happen in 1970 when the US-Japanese Security Treaty comes up for review. Charles E. Tuttle Co., Rutland, Vt. 215 pages. \$2.95.

Heroes & Aeroplanes of the Great War, 1914-1918, by Joseph A. Phelan. A vivid pictorial presentation of the men whose fragile air machines changed the world's thinking about ways of waging war. Grosset & Dunlap, N. Y. 128 pages. \$7.95.

The Murder of TSR-2, by Stephen Hastings. The author calls the final cancellation of the British aircraft TSR-2 "a tragedy," and analyzes the need for change in Britain's aircraft procurement methods. Macdonald & Co., Gulf

House, 2 Portman St., London, W. 1. 206 pages. 35s net.

Strategic Terminology, by Urs Schwarz and László Hadik, with an introduction by Louis J. Halle. A trilingual glossary of politico-military terms compiled under the aegis of the Graduate Institute of International Studies in Geneva. Frederick A. Praeger, N. Y. 157 pages. \$6.75.

The Struggle for Peace, by Leonard Beaton. A study of the implications of nuclear power; it was a basis for a television series of the same name, coproduced by National Educational Television. Frederick A. Praeger, N. Y. 118 pages. \$3.95.

Telescopes, edited by Thornton Page and Lou Williams. Volume 4 in the *Sky and Telescope Library of Astronomy* is a collection of articles on astronomy developments and how to make and use telescopes. Macmillan Co., N. Y. 338 pages. \$7.95.

Your Career in the Aerospace Industry, by Waldo T. Boyd. For the young person seeking new horizons, here is an introduction to a field in which even the sky is no longer the limit. Simon & Schuster, N. Y. 222 pages. \$3.95.

—JAQUELINE A. DAVIS



This is full-scale model of Navy's Poseidon sub-launched ballistic missile being developed to replace Polaris. Equipped with multiple warheads, Poseidon will be eight times more potent than its predecessor, the Polaris A-3.

substantial efforts are being made to understand and combat CAT, no coordinated national program exists, research and development are neither sufficient nor nationally directed, weather forecasts are inadequate, and CAT message priorities are too low.

It recommended that a National CAT Data Collection Project be established with DoD as executive



Navy is buying nine Grumman Gulfstream I turboprop light transports for use in training crews for Grumman A-6A Intruder. Designated TC-4C, plane is fitted with Intruder radome nose housing search and track radar antennas. Cabin contains separate A-6A avionics system with cockpit for student pilot and bombardier/navigator, and instrument readout consoles for four additional students.

agent, and that the Federal Committee for Meteorological Services and Supporting Research review the program periodically to determine the need for further joint agency action.

Establishment of a National CAT Forecasting Facility was recommended, capable of maintaining a continuous CAT watch to produce more detailed forecasts and provide a national focal point for CAT data. It noted that ESSA plans to set up such a facility within eighteen months to serve the continental US.

Serving with General Catton on the committee were representatives from ESSA, FAA, NASA, National Science Foundation, and State Department.



Six more great names in US avia-

tion have been enshrined in the Aviation Hall of Fame in Dayton, Ohio, bringing to twenty-six the total of those so honored since the annual ceremony began in 1962.

With Gen. J. P. McConnell, USAF Chief of Staff, among those participating in enshrinement activities on the sixty-third anniversary of the Wright brothers' first flight, December 17, latest additions to the Hall of Fame are Maj. Gen. William (Billy) Mitchell, Robert H. Goddard, Glenn L. Martin, William E. Boeing, Adm. John H. Towers, and Lincoln Beachey.

The Aviation Hall of Fame was chartered by Congress in 1964 to honor aviation's outstanding pioneers, to perpetuate their memory, and to record for posterity the excellence of their achievements.

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NEWS NOTES—Cessna's Super Skymaster, the Air Force's new forward air controller plane, has been assigned the military designation of O-2. First production aircraft will be available to begin aircrew training in April, with the first squadron to be operational by midsummer. The O-2 will replace the O-1 Bird Dog on a one-for-one basis. It will be equipped with four wing pylons for carrying rockets, flares, and other light conventional ordnance, including a 7.62-mm Minigun.

A \$900,000 contract to study advanced penetration aids systems has been awarded to Avco's Missile Systems Division by AFSC's Ballistic Systems Division, Norton AFB, Calif. The program, sponsored by DoD's Advanced Research Projects Agency, is designed to provide techniques for use in development of penetration aids to increase the capability of USAF ballistic missiles.

In this column in the November issue, we erred in calling North American's T-28 the world's second most popular airplane, behind the Douglas C-47. It should have been the North American T-6 Texan, which is flown in fifty countries around the world. Versions of the T-28, including the French-modified Fennec, appear in inventories of sixteen nations.

A Museum of Flight Medicine has been established at AFSC's Aerospace Medical Division, Brooks AFB, Tex. It is a central, permanent repository for the collection of memorabilia relating to the development of aviation medicine. Mrs. Katherine E. McCray, curator, is seeking old medical equipment, photographs, emblems, or other items that will enable the Museum to portray the development and progress of flight medicine.

The British Defense Ministry is reviewing a proposal for a new manned bomber—code-named GLARE, for Ground-Level Attack, Reconnaissance, and Electronic countermeasures—which would be developed from the Hawker Siddeley Buccaneer. Its designers claim it would be more effective in low-level penetration below enemy radar than any other available plane, including the General Dynamics F-111, at substantially less cost. Difficulties in getting together with France on development of a variable-sweep-wing long-range strike aircraft, and the higher unit price Britain would be required to pay if it were to seek additional F-111s beyond the present fifty-plane order, are apparently prompting more than casual interest in the proposal.—END

ANOTHER LETTER FROM ARNIE



HYDRO-AIRE

3000 Winona Avenue, Burbank, California

DIVISION OF

CRANE

To the hundreds and hundreds of people who wrote to Hydro-Aire in concern about Arnie the Ad Man and his misadventures in Okefenokee, let us immediately assuage your fears. He is not dead. He is alive in Georgia... with his attache case so thin it only has one side, his striped button-down shirt with mind to match and the onion-stuffed olive that he wears in his lapel.

He wrote (again from Georgia):

"Dear Boss...

"Good News!! I am on my way home.

"But have I got some inside poop for you! I was sharing some ham and greens with an Air Force Colonel and he told me that Hydro-Aire has been given a contract to retrofit about 600 C-130 Hercules transports with the Hytrol Mark II anti-skid braking systems. Now, that's big news.

"Don't write any ads about it until I get back. I am stopping off to see my cousin in Provo, Utah, so I should be seeing you in a week.

"Love,

"Arnie."

By some strange set of circumstances, we at Hydro-Aire have been aware of this good news for some time. The Air Force has long felt that the logistic capability of the Hercules could be expanded for small airfield use if the landing roll could be shortened.

The aircraft was already equipped with the Hytrol Mark I. What could the Mark II do? Could it land on the deck of an aircraft carrier in heavy seas without the use of arresting gear?

It could.

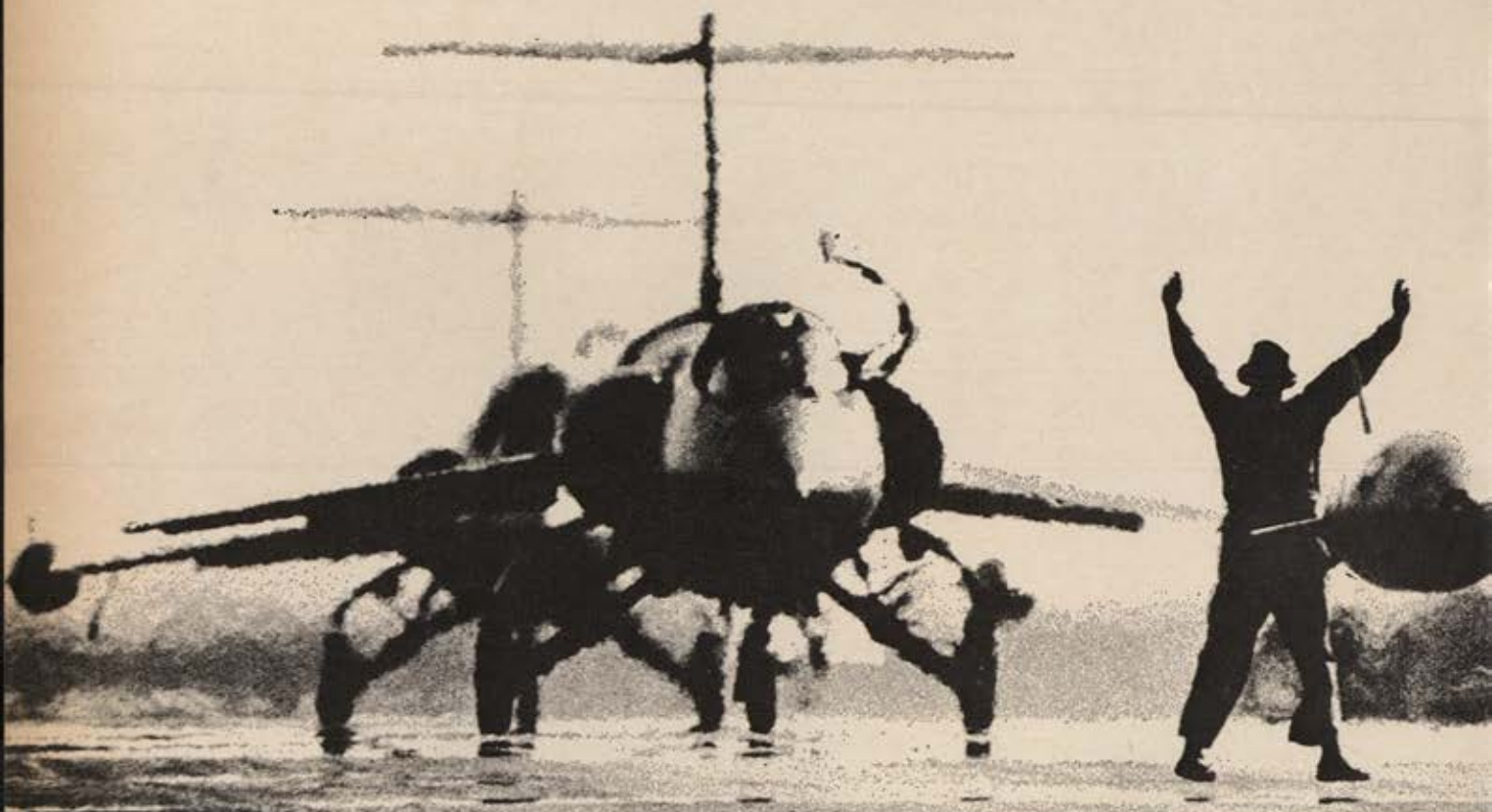
Once we had proved this point, it was only a question of time and logic to change an already good aircraft with an excellent skid control system into an excellent aircraft with the finest skid control system available.

Tell you what.

This ad is going to make Arnie pretty nervous. Ergo. Anyone sending a letter of comfort to the poor boy in care of Hydro-Aire will receive a portrait of Arnie for his very own wall.

As Arnie says, "Just put the words down on paper and see if the cooky crumbles."

Mission: Go up and get'em...



Maintaining air superiority and defense are continuing missions of the United States Air Force. Lockheed has responded to the



demands of these missions with a family of fighters that dates back to the early days of World War II...the P-38, F-80, F-94, F-104, and now the YF-12A. □ It was the P-38 Lightning in which the two top aces of WWII scored their kills. The first American jets to fly in combat were Lockheed-

built F-80's. Today, in Vietnam, the F-104's are ready for any



challenge to the Air Force's undisputed mastery of the air. □ And flying today is the interceptor of tomorrow, the Mach 3, 80,000-



foot altitude YF-12A, holder of 9 world speed records and Lockheed's latest response to air defense in this era of ever-increasing aircraft technology. □ Going even beyond the YF-12A, Lockheed is working in the hypersonic speed regime, testing materials and designs that may well find

application in future generations of Air Force fighter aircraft. □ The ability to understand present mission requirements and anticipate future ones, coupled with technological depth and competence, enables Lockheed to respond quickly to the needs of defense in a complex, divided world.

LOCKHEED

AIRCRAFT CORPORATION, BURBANK, CALIFORNIA

Would the SST Be a Better Bomber Than AMSA?

Unquestionably yes, says AF/SD's Technical Editor. The Boeing version of the SST would make an excellent bomber. With only slight modification, the SST could be made into a military aircraft with a range of 8,000 miles—as good as that of late-model B-52s. Its load-carrying capability would be greater than that of the B-52, and its variable-sweep wings give it an exceptional versatility.

By J. S. Butz, Jr.

TECHNICAL EDITOR, AIR FORCE/SPACE DIGEST

Cover illustration by Gordon Phillips

THE Boeing design selected to be the US supersonic transport could easily become the best bomber the world has ever seen.

Only slight modifications would be needed to give this very large airplane (675,000-pound maximum takeoff weight in the civil version) range and load-carrying ability equal to, or better than, that of the late-model B-52s. In addition to this unrefueled range of around 8,000 miles, the SST-bomber would have better potential than any long-range aircraft yet built for penetration of sophisticated missile-armed air defenses.

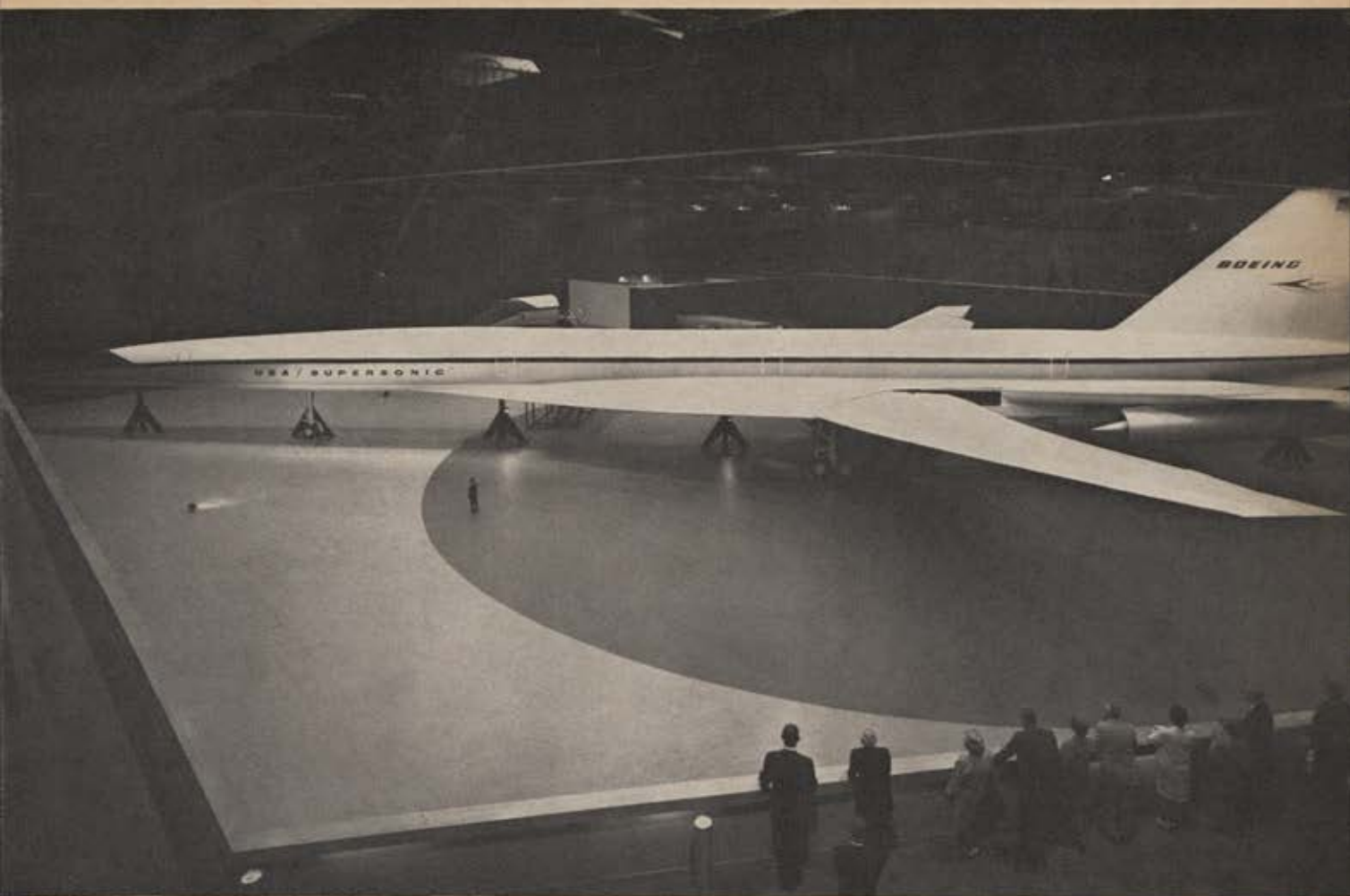
The latest specifications laid down by the Federal Aviation Agency and the airlines call for the SST to have outstanding engines, high aerodynamic efficiency, and a relatively low percentage of structural weight. These three factors—aerodynamic, structural, and propulsive efficiency—are the keys to achieving long range with any type of airplane, and on the SST they are to be at the very limit of today's state of the art. Technology just can't be pushed any further in achieving long range with a supersonic airplane. Government and industry explanations of the SST project during the past two years have made this fact crystal clear.

Two conclusions then must follow this fact about

the advanced nature of the SST design. First, any high-speed bomber laid down by the Air Force in the near future must use SST technology. There is none better.

Second, the SST, if it meets all of the FAA's specifications, could be modified into a superlative bomber. It wouldn't meet all of the requirements that have been discussed for a new manned bomber for the 1970s and 1980s, but it would come very close. Several versions of the new bomber, AMSA (Advanced Manned Strategic Aircraft), have been proposed, and it is not clear today exactly which one is favored by the Air Force. However, a bomber version of the Boeing SST would not fall seriously short of any of the AMSA requirements. For many of them the SST-bomber would outfly the AMSA.

By any technical standard the Boeing SST is an obvious candidate for consideration as the new Air Force strategic bomber. The Lockheed design, which was stiff competition for the SST mission down to the final FAA selection, would not have been nearly as attractive as a bomber because of its fixed double-delta wing. The double delta's aerodynamic efficiency (lift-to-drag ratio) is very high at supersonic speeds, but it falls off substantially at subsonic speeds. The Boeing variable-sweep wing has much more military



Boeing SST, shown above in mockup form, will, if it meets all design specifications, be one of the most efficient long-range aircraft ever built. Converting it into an outstanding strategic bomber would be relatively simple. SST has the payload to carry more than a dozen SRAMs (Short-Range Attack Missiles) and could attack multiple targets.

potential because its sweep angle and span can be varied to yield a high aerodynamic efficiency at both supersonic and subsonic speeds, and at low and high altitudes. Consequently, the Boeing design has versatility, *i.e.*, good range and/or endurance under all flight conditions.

Versatility has been a much-sought military virtue since high-altitude anti-aircraft missile defenses have become so potent. It was a lack of versatility in a single-point, high-altitude, high-speed design that is generally considered to be the key reason behind the B-70 cancellation.

Seemingly, the selection of the Boeing SST offers the Air Force a powerful new option in solving its problems of buying new weapons. When the civil decision is made to mass produce a large, highly efficient, long-range supersonic airplane, there will be an opportunity for the USAF to save some money in a bomber program. There is reason to believe that the cost savings would be so large as to substantially improve the chances that a new bomber will be allowed by the DoD.

The budget squeeze was tight enough before Vietnamese War costs soared to above \$20 billion annually a year or so ago, and now they must be excruciating. It is fairly obvious that only a few major new weapon

systems can be built in the next decade. The long list of candidates includes: an antimissile defense for the United States, with an estimated five-year cost of around \$25 billion; third-generation ICBM and submarine-launched strategic missiles, which apparently are needed to keep up with increasing Soviet potential in long-range war; a manned space capability for the USAF; a new air-superiority fighter and a host of improvements for USAF and Navy tactical air forces; a nuclear-powered surface Navy; and literally dozens of other systems being actively studied by all three services.

The Air Force hope of getting an AMSA and keeping a very strong mixed force of bombers and missiles past the mid-1970s seems very slim. Estimated five-year costs for the development and deployment of 200 AMSAs range from \$8.9 to \$11.5 billion, at an average figure around \$50 million per aircraft.

No doubt remains about the position of major Pentagon leaders on the AMSA question. Secretary of Defense Robert S. McNamara flatly does not think an AMSA is needed. However, he does believe that a mixed force of bombers and missiles is valuable in the strategic war equation. The major reason, apparently, is to compel the Russians to keep a combined missile
(Continued on following page)

and aircraft defense. DoD studies show that if they are faced only with US missiles, the Soviet defense system's costs would drop substantially. Mr. McNamara, by using the most inexpensive possible strategic attack aircraft, wants to force the Soviets to maintain the expensive bomber defense so that the balance of strategic war costs will be in our favor.

It is this thinking that resulted in the decision to stretch the multipurpose employment of the General Dynamics F-111 tactical fighter even further than originally planned and to use a version of it as a long-range strategic bomber. The Secretary's current plan is to phase out the B-52C/Fs and the B-58s and to replace them with the FB-111. The strategic bomber force at the end of Fiscal 1971 is to consist of 210 FB-111s and 255 B-52G/Hs.

Congressional testimony last year showed that Mr. McNamara does not believe that the B-52G/Hs need to be replaced after they wear out, which is expected to occur around 1975. The main hole the B-52 departure would leave is said to be a reduction in US capacity to drop large tonnages of conventional bombs on tactical targets, as we are now doing in South Vietnam. The plan, apparently, is to modify the Lockheed C-5A for this mission and actually increase our capability.

When the stretching of the F-111 into the strategic role was first announced, many reporters got the impression that this was an interim arrangement to fill in until an AMSA or some other long-range bomber could be developed. But in his testimony last year Mr. McNamara dispelled this idea. He said, "I believe it is clear . . . that the FB-111 is not an interim aircraft but is, indeed, a truly effective strategic bomber."

Air Force Secretary Harold Brown told Congress he disagreed with Secretary McNamara and believed that a follow-on bomber to the B-52G/H is required. However, as of last spring, he was not certain just what configuration the AMSA should have. Generally he agreed with the AMSA selected by the Air Force and reported on to the Congress by Chief of Staff Gen. J. P. McConnell. This aircraft would have a normal gross weight around 300,000 pounds and would be optimized for the nuclear mission. Today, this means a capability for final penetration to the target at low level and high speed for a range greater than 200 miles.

Mr. Brown had reservations about the configuration reported by General McConnell primarily because studies had not been completed to establish its usefulness when carrying conventional bombs. This consideration could cause some modification of the design.

However, for all intents and purposes it is safe to say that the AMSA has been designed to achieve the maximum of versatility. That is, it can attack targets at speeds well over Mach 2 at high altitude, and at 600 mph (maybe 900 mph) when flying at very low altitudes. It can deliver gravity bombs and/or stand-off missiles, and it will have bombing gear, navigation, reconnaissance, and electronic countermeasures equipment that is substantially better than today's variety. In size, the AMSA will approximate the Concorde. However, it will have variable-sweep wings and a

duct-burning turbofan engine to provide the kind of flight flexibility and versatility demanded.

Secretary Brown has described the AMSA as combining the B-52's range and payload with the speed and maneuverability of the FB-111.

A brief look at the Boeing SST data establishes that it, too, has B-52 range and payload with the speed and maneuverability of the FB-111. In fact, its 76,000-pound maximum payload is bigger than the maximum 60,000 pounds of conventional bombs the B-52 can carry for short ranges. And the SST's cruising speed of Mach 2.7 is greater than the FB-111's maximum speed of Mach 2.5.

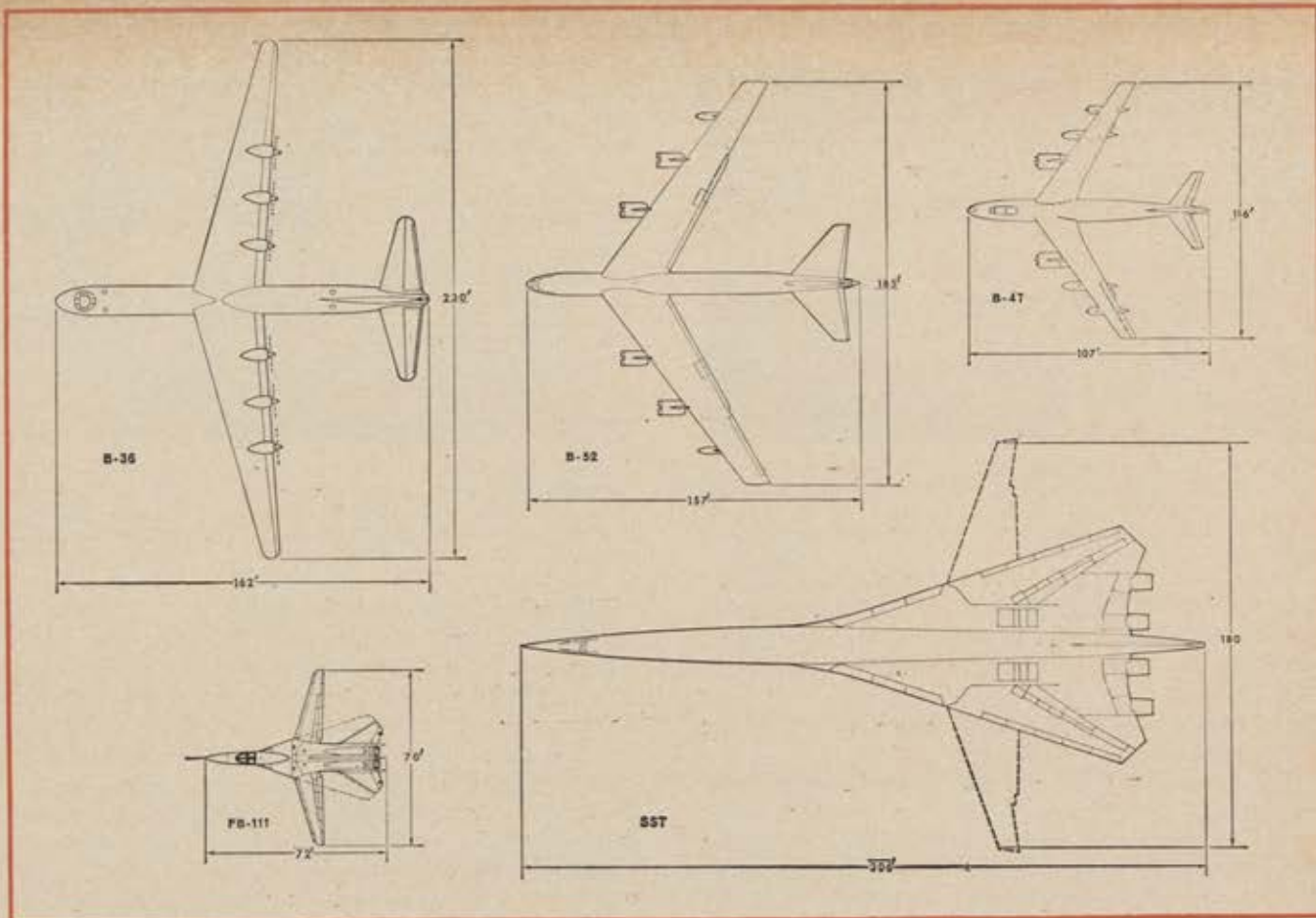
Range of an SST-bomber is easily estimated with enough accuracy to firmly establish its potential. The FAA says the commercial airplane will take off at 675,000 pounds and carry a payload of about 65,000 pounds (313 passengers and baggage) a little more than 4,000 miles. Around fifty percent of this total weight, or 337,500 pounds, would be fuel. Climb-out and acceleration to cruise speed would use up about one-third of the fuel, and fuel reserves required for commercial operation would eat up around twenty percent of the total, so approximately 150,000 pounds would be available for cruise. The cruise portion of the flight would be about 3,600 miles, as 400 miles or so would be covered during the climb-out and acceleration to cruise Mach number.

At the cruise speed of Mach 2.7, or 1,800 mph, two hours would be required to travel the 3,600 miles. Fuel consumption for the SST, then, is about 75,000 pounds of fuel per hour.

So, if the range is to be increased to 8,000 miles, about 165,000 pounds of extra fuel must be provided for 2.2 hours of extra flying. About 60,000 pounds of this is immediately available from the civil fuel reserves, but not required for the military mission. Another 20,000 pounds could come out of the payload and still leave a 45,000-pound useful military load, which is substantially larger than the amount a B-52 can carry for 8,000 miles. Therefore, to get the 8,000-mile range, it would be necessary to take out the passenger seats and add cabin tanks for 85,000 pounds of fuel. These would take up less than half the cavernous cabin that can accommodate a maximum of 350 passengers. There would be plenty of room left for electronic gear, bombs, and other military equipment.

Total takeoff weight of this 8,000-mile SST-bomber would be 760,000 pounds, only 85,000 pounds higher than the civil version. This percentage of overload is light by military standards, and it undoubtedly could be handled easily by the Boeing SST landing gear, which is a multiwheel assembly.

A number of modifications to the Boeing SST design could be made to improve its performance as a bomber. Two of them would be especially effective. First would be the replacement of the simple turbojet with afterburner that General Electric is building for the commercial aircraft. This engine was designed primarily for the Mach 2.7 cruise condition, and it is very efficient there. However, the bomber must have more versatility, and it would be advantageous to replace the simple turbojet with some sort of fan en-



Size of the Boeing SST is evident in the scale drawing above. The FB-111 is shown slightly out of proportion, about $\frac{1}{8}$ larger than actual scale. The SST has the range of the B-52 and the flight versatility of the FB-111. Its large payload would enable it to carry a big crew, elaborate defense penetration aids, and as many nuclear weapons as a Polaris sub. Without question it could conduct reconnaissance and attack several targets on a single mission.

gine. The duct-burning turbofan that Pratt & Whitney built for the SST competition would be the obvious choice. It has at least fifteen percent lower fuel consumption at subsonic speeds.

A second modification that could materially improve range would be a redesign of the fuselage. Total drag of the airplane would be reduced substantially if the fuselage diameter were decreased three or four feet. A gain in range of close to 1,000 miles could probably be achieved with the optimum fuselage, and it would still have enough internal volume to hold the fuselage fuel, equipment, and weapons needed on the bomber mission.

One Air Force decision is critical to the final design of either an AMSA or an SST-bomber. This has to do with the speed for the final low-level penetration to the target. When the F-111 was designed, Mach 1.2 (900 mph) penetration speed was considered necessary for survival in a heavily defended area. Supersonic speed on the deck had never been required of any other aircraft. It was the most stringent of all the requirements on the F-111 and the source of many development problems.

More recently, a strong body of USAF opinion has developed against the Mach 1.2 penetration speed and in favor of Mach 0.9. Vietnam experience indicates that properly handled aircraft flying Mach 0.9 on the deck probably would have acceptable survival

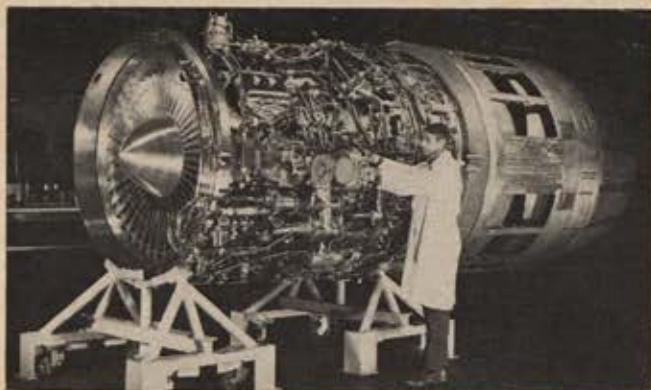
chances against even the most sophisticated defenses. And the F-111 experience shows that development costs probably could be reduced substantially with the lower penetration speed.

If Mach 1.2 on the deck is demanded, major structural strengthening to withstand the heavy air loads would be necessary to convert the commercial SST to a bomber.

Most Air Force officers with any experience in procurement see possible management problems for the SST-bomber that could far outweigh technical difficulties. They fear three-headed, or even two-headed, management teams and any effort to make major compromises in aircraft design. The nuclear-powered aircraft project is cited as the prime example of multi-headed management when every decision, large and small, had to be approved by USAF, the Atomic Energy Commission, and the Department of Defense.

In this view, it would have been a monumental mistake if the Air Force had had a hand in laying down the SST requirements so that it would have been an optimum bomber as well as a transport. It probably couldn't have been done to anyone's satisfaction, and the program would probably never have gotten off the ground.

As for the future, and a possible SST-bomber project, these same management people feel just as
(Continued on following page)



Pratt & Whitney JTF17, duct-burning turbofan, above, lost SST competition but is considered a more versatile bomber engine than the GE afterburning turbojet, right, because it has substantially lower fuel consumption at subsonic speeds. JTF17 was developed in West Palm Beach, Fla.



General Electric GE4 afterburning turbojet, above, being developed for SST, is very similar to the GE YJ93, which powers the XB-70. General Electric says its design objective was to achieve simplicity. One of the most advanced jets ever built, its turbine-inlet temperature is around 2,400° F.

strongly that the FAA, the airlines, and the contractors should be left alone to work out their transport problems. The result should be a more rapid development program and a good airplane optimized for long range, one which could be converted to a bomber with a minimum of trouble.

Cost predictions for a fleet of SST-bombers are risky at best. If the fuselage were made smaller, costs probably would jump \$100 million or so. If the pure turbojet engines were replaced with duct-burning fans, more than \$500 million additional would be needed. A commercial SST is expected to cost at least \$35 million each compared to a projection of about \$50 million for an AMSA. The bombing and navigation system would push the SST-bomber price up over \$35 million, as would any engine or fuselage changes.

The chance for major cost reductions, in the billions in the over-all program, lies in the probability that the SST-bomber would be considerably more effective than an AMSA. The SST has a much larger payload and internal volume to carry the payload than the AMSA. It could carry more than a dozen SRAM-type (Short-Range Attack) Missiles. Possibly one SST could carry as many missiles with as much total explosive yield and hit as many separate targets as a Polaris submarine.

It would be difficult to understand how one SST-bomber would not be as effective as two AMSAs. Consequently, one could think of a fleet of 100 SST-bombers to do the job of 200 AMSAs, and the total purchase cost of a follow-on bomber force for 1975 through 1990 or so would be around \$5 billion instead of \$10 billion.

One thing is certain. It makes no sense to talk of the FB-111 doing the job of either the AMSA or the SST-bomber. The FB-111 is one-third the size of the AMSA and around one-tenth the size of the SST. It is severely limited in storage space for weapons. While their flight flexibility and versatility is about equal, the FB-111 would not have nearly the capability of an SST-bomber for penetrating modern defenses. The FB-111's two-man crew, with their limited space for electronic countermeasures equipment, decoys, and defensive missile armament, could not hope to operate against air defenses as effectively as could the big

SST-bomber crew and their penetration resources.

In the critical area of range, the FB-111 is badly outclassed. This doesn't mean that the F-111 won't turn out to be a sound airplane and the most versatile fighter ever built. However, it has become clear that the F-111, even though it will be outstanding in today's terms, is still not going to meet the original performance specifications. The drag is higher than originally estimated, and the range will be lower. Originally, the maximum ferry range was to be 4,100 miles when flying at subsonic speeds and high altitude, with large external tanks and one nuclear weapon. When configured for the supersonic nuclear attack mission—when it is impossible to carry significant external fuel, if any can be carried at all—the range drops under 3,000 miles.

Mr. McNamara has said that the FB-111 will have "approximately the same range" as the early model B-52s. In this case of apples compared to apples, with both aircraft in the nuclear-attack configuration, he apparently meant that the FB-111 has "approximately" fifty percent or sixty percent of the early B-52 range. At any rate the FB-111, with a very small load of nuclear weapons, would have less than half the range of an SST-bomber with a Polaris-submarine-size load.

If the Boeing SST meets all of the FAA specifications, sells as widely, and shows the growth potential now predicted, the aviation world could be a strange and wonderful place twenty years from now. If this happens, more than 1,000 SSTs would be in airline service in 1985. The SST would be as easy to maintain and as dependable as the present subsonic jetliners, flying eight hours a day, day-in and day-out. SST operating costs would be lower than those of the 707 today. In addition to the masses of people moving great distances at supersonic speeds it is possible that the high-priority freight business might be of economic importance.

Unless the SST project falls on its face, this supersonic world of large, efficient airplanes is only one development program away. But first the Department of Defense is going to have to be convinced, and quickly, that this world has some military significance or the USAF will not have any part in it.—END

Surprisingly, President Johnson did not follow the selection of the Boeing-General Electric team to build the American SST with a decision to proceed with prototype construction. But the program's congressional supporters are confident that the decision will not be long in coming, and the air carriers are also pushing for the go-ahead decision. Every day's delay puts the US that much more behind the British-French and Russian programs. Meanwhile, the White House remains silent . . .

The American SST: Ready and Waiting

By Edgar E. Ulsamer

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

ON THE last day of 1966 the Federal Aviation Agency announced that the thirty-month-old source selection competition on the American supersonic transport had ended. The Boeing Co. and the General Electric Co. were the winners.

The question of why the Presidential Advisory Committee under Secretary of Defense Robert S. McNamara, plus the 235 government experts and representatives from thirty foreign and domestic airlines, selected Boeing's variable-sweep-wing airframe design over Lockheed's double delta, and General Electric's afterburning engine over Pratt & Whitney's duct-burner design, was not answered, either publicly or to the losing contractors.

The losing companies will be reimbursed for their direct SST work. Lockheed should receive about \$20 million and Pratt & Whitney about \$15 million, since their designs met the basic performance parameters set by the government. Surprisingly, President Johnson and the FAA did not follow up the contractor selection with a government decision to advance the SST program into the long-awaited prototype construction and test phase. At a Texas news conference the President said: "Just when the decision to move ahead will come on [the] part of the executive, the legislature, I am unable to predict at this moment."

Cautious Optimism

FAA Administrator William F. McKee noted that the winning contractors will continue to perform development, testing, and design refinement "on a month-to-month basis," and his agency will continue to explore certain economic aspects of the program. A highly placed government source commented: "While only half a decision has been made so far, cautious optimism concerning eventual full go-ahead is indicated." Two of the SST's mentors in the US Senate, Senators A. S. Mike Monroney (D-Okla.) and Warren G. Magnuson (D-Wash.), felt the President

would not permit any lengthy delays in the SST program.

There exists a remote possibility that a presidential decision to launch the prototype phase may show itself in the currently pending Fiscal 1968 budget request, but informed officials predicted that additional SST funding would be covered out of the contingency portion of the budget. Such was the case last year. No direct congressional approval to proceed with prototype construction is necessary since Congress last year allocated \$200 million for this purpose in a supplemental FY 1967 appropriation.

Senator Monroney said that between \$220 million and \$250 million in new money would be needed for Fiscal 1968 to move the prototype construction program forward at maximum speed, in addition to already-allocated funds. Senator Monroney, who heads the Senate's Aviation Subcommittee, said that to delay the SST program for the sake of temporary savings "would cost this country a very dear price, many times more than can be saved. We simply can't afford any more delays on an international SST." Industry officials estimate the direct cost of delaying the SST program at about \$4 billion annually, with over 130,000 jobs and over \$1 billion in yearly wages hanging in the balance.

Spokesmen for the Anglo-French consortium building the 136-passenger Mach 2 Concorde, responding to the delayed decision as to American SST construction, raised their sales forecasts to a minimum of 200 Concordes sold by 1975. This represents a value of well over \$4 billion.

Senator Monroney said that even if initial SST operations were to be confined to overwater flights because of adverse public reaction to sonic boom, about eighty percent of all international routes would qualify for supersonic operation. He added that the American SST's variable-sweep-wing design permits subsonic operation without penalty in fuel consumption.

(Continued on following page)



Variable-sweep wing feature of the SST is shown in triple-exposure view of SST mockup in Seattle: wings positioned for takeoff (fully extended), for subsonic cruise (intermediate position), and for supersonic cruise (folded back).

US experts believe that subsonic operation of the fixed-wing Concorde or the similarly configured Soviet TU-144 SST would increase fuel consumption significantly.

Senator Magnuson, who is the head of the Senate's Commerce Committee, stated that the current pause in the SST program was "no more than a little hitch. I know we will go ahead with the program." Senator Monroney shared this opinion but was "concerned" over the prospects for obtaining additional funding from Congress, pointing at the "close vote we had last summer [fifty-five for the program, fourteen abstentions, and thirty-one opposed] when the SST opposition was not nearly as organized nor as inflamed by hostile news media as is the case now."

Both senators and other sources expressed the belief that the ten US carriers whose present or future route structures require SSTs "will fight strongly for speedy construction of the American plane because they know that in order to retain their share of the market they need their own rather than foreign equipment."

Encouragement from the Airlines

Virtually all US carriers have exhorted the government to proceed with the manufacture of the SST as rapidly as possible. Juan T. Trippe, Pan American

World Airways' chief operating officer, said any delay "would be tragic," adding that "Congress should not forget that an SST—designed, tested, and built in America—will truly represent, for the next generation, the best in American know-how, American science, and American genius throughout the world." He added that the SST could affect the US balance of payments to the extent of \$50 billion.

R. W. Rummel, TWA's vice president for planning and research, stressed that the development of flying prototypes of the American SST, after years of studies costing, according to FAA figures, about \$300 million, "should proceed on an expedited basis." He added that intensive studies by the world's airlines established the need for "the commodious passenger arrangements that will be available in the US SST as compared to the fairly restricted accommodations planned for the British-French Concorde." He indicated a recent TWA survey of some 200,000 travelers indicated enthusiastic public acceptance of the SST and "that even with some fare differential, supersonic transportation will be in high demand."

As for sonic-boom restrictions, Mr. Rummel explained that a recent TWA study established that an around-the-world flight from New York to San Francisco would cost five percent more if all land overflights were subsonic rather than continuously supersonic. Such a penalty "while undesirable, would not be intolerable," he said.

The Boeing-GE SST

With source selection accomplished and after a full review of the proposed design by the world's airlines, the American SST, in terms of looks and performance, has crystallized into a more or less definite form in spite of the contractors' determination "to keep on refining the design until the very minute we start cutting metal."

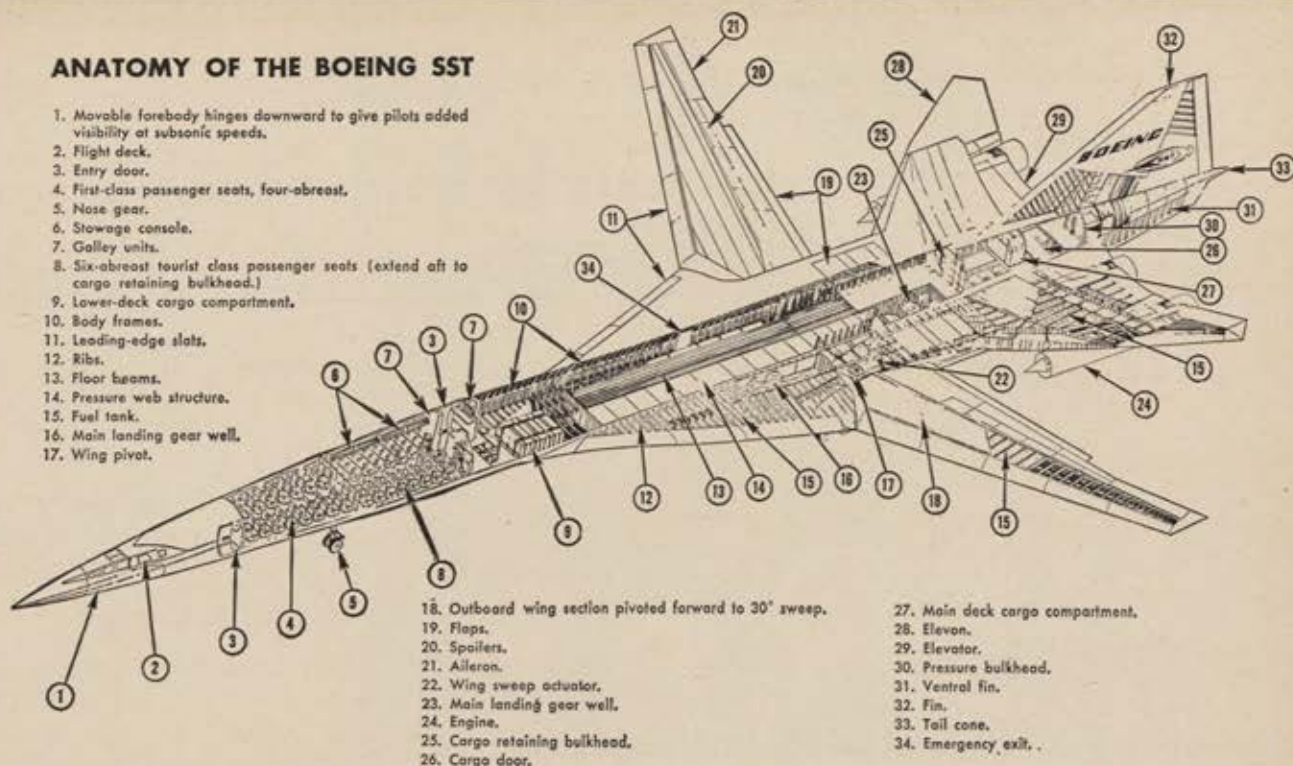
The first American SST will be 306 feet long, forty-eight feet tall, weigh 675,000 pounds on takeoff, cruise at about 65,000 feet at Mach 2.7, and have a range with the FAA-prescribed fuel reserves of 4,250 miles, or sufficient for a New York-to-Rome flight.

Its payload capability over the full range will be 75,000 pounds or about 350 passengers in an all-economy configuration. In case of a mixed first-class/economy-class configuration, the Boeing SST, which bears the tentative designation 2707, will carry anywhere between 280 and 313 passengers depending on interior layout and width (up to twenty feet in the currently favored extreme area-rule design permitting seven-abreast seating with two aisles in the wide section). Six galleys and a like number of rest rooms will be provided, and the aircraft will be able to accommodate considerably more baggage per passenger than contemporary international jets of the 707 and DC-8 type.

There is little question about the American SST's versatility: It will be greater than that of any commercial aircraft ever built because of its variable-sweep wing. The sweep angle will range from twenty degrees swept forward for landing to seventy-two

ANATOMY OF THE BOEING SST

1. Movable forebody hinges downward to give pilots added visibility at subsonic speeds.
2. Flight deck.
3. Entry door.
4. First-class passenger seats, four-abreast.
5. Nose gear.
6. Stowage console.
7. Galley units.
8. Six-abreast tourist class passenger seats (extend aft to cargo retaining bulkhead.)
9. Lower-deck cargo compartment.
10. Body frames.
11. Leading-edge slats.
12. Ribs.
13. Floor beams.
14. Pressure web structure.
15. Fuel tank.
16. Main landing gear well.
17. Wing pivot.



18. Outboard wing section pivoted forward to 30° sweep.
19. Flaps.
20. Spoilers.
21. Aileron.
22. Wing sweep actuator.
23. Main landing gear well.
24. Engine.
25. Cargo retaining bulkhead.
26. Cargo door.

27. Main deck cargo compartment.
28. Elevon.
29. Elevator.
30. Pressure bulkhead.
31. Ventral fin.
32. Fin.
33. Tail cone.
34. Emergency exit.

Diagrammatic view of Boeing's 2707 SST shows massive interior space of the 350-passenger aircraft including cargo space which on a per-capita basis exceeds that of contemporary large subsonic jetliners. Not shown in drawing is seven-abreast seating with two aisles in the wide section of the heavily area-ruled design currently favored by Boeing.

degrees swept back for supersonic cruise. In the latter position the wings are integrated with the tail to form a delta shape.

The seventy-two-percent sweep is sufficient to avoid shock waves generated at the wing roots from hitting the wingtips even at Mach 3-plus speeds, according to NASA wind-tunnel studies. This factor is considered vital for eventual speed growth of later SST models.

On the other end of the speed spectrum, the 2707 will be able to take off fully loaded from 5,700 feet of runway at about 180 mph, which is below the requirements of contemporary large jets. For landings the Boeing SST will require about 5,800 feet of runway and a minimum speed of 146 mph, comparable to today's international transports.

With the wings placed in an intermediate position, the 2707 will cruise efficiently at speeds equal to today's fastest subsonic airliners. Fixed-wing aircraft designed for supersonic flights generally experience fuel-consumption increases of up to thirty percent when operating subsonically. The 2707's subsonic capabilities are a vital safety asset when subsonic over-ocean flight is necessitated by engine failure or for other reasons. They are equally vital, of course, if supersonic overflight is prohibited for political or other reasons by any one nation.

Boeing officials stress that the 2707's low-speed handling and landing and takeoff characteristics will match those of the best subsonic aircraft. Slotted trailing-edge flaps and leading-edge slats along eighty-five percent

of the wing will augment lift in the low-speed regime, permitting in turn rapid climb-out and low engine power settings during approach and landing.

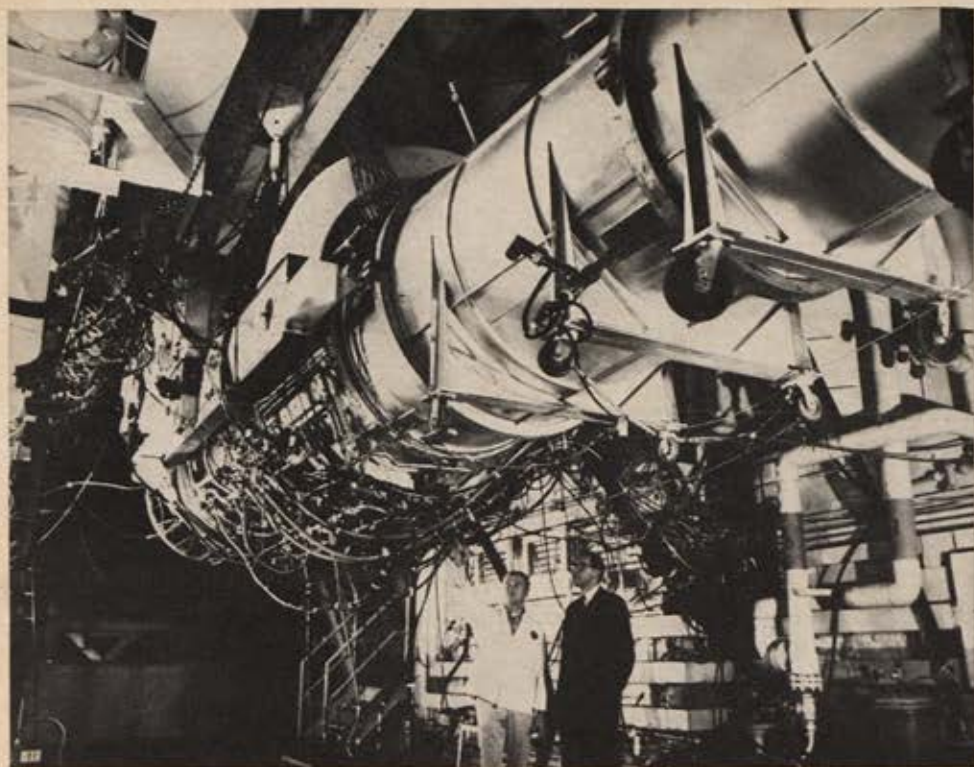
Boeing officials claim that two important fringe benefits flow out of the 2707 high-lift capabilities: On landing the pilot will not have to rotate the aircraft more than with present equipment, and both the fast climb-out and lower power settings on landing will ease critical noise problems.

The Noise Problem

Noise is a touch-and-go proposition. The manager of Los Angeles International Airport, Francis T. Fox, stated recently that unless improvements in the lateral noise spread are achieved he will not be able to permit SST operation at Los Angeles.

Boeing Vice President and SST Program Director Maynard L. Pennell is convinced the problem can be solved. "With engines more than three times as powerful as those on existing intercontinental airplanes, more noise will be created on and near the airport during takeoff roll and initial climb. However, the airplane will climb more rapidly and will make less noise in the community beyond the runway if noise abatement procedures using substantial reductions in power are successfully developed," he said. He emphasized that the SST's landing and approach noise should be "significantly less than on today's airplanes." An important feature in the 2707's noise suppression

(Continued on following page)



General Electric's GE4 engine, a thrust-augmented (after-burner-equipped) turbojet design, produces over 60,000 pounds of thrust, or more than three times the power of the best commercial propulsion plants currently in operation. Operating in rarified air above 60,000 feet during cruise, engine features variable-geometry inlet to obtain maximum airflow. Turbine inlet temperature will exceed 2,000 degrees Fahrenheit. GE won the SST engine competition over Pratt & Whitney's duct-burning fanjet design.

are the variable-geometry inlets which regulate airflow from minimum at low speed to maximum at high speed. They can choke out the high-pitched sound from the compressors.

Pilot visibility, in spite of the aircraft's great length and projectile-like shape, will be better than in the best current subsonic equipment, according to Boeing spokesmen. The double-articulated nose of the aircraft is jointed just forward of the flight deck and again near the tip for better ground clearance. During cruise the nose is fully streamlined to diminish drag. In addition, strategically placed television cameras will enable the pilot to monitor the aircraft's position in relation to runway or gate position.

Extremes of Temperature

The 2707 will be a durable aircraft despite the temperature extremes it will encounter. Its leading edge will heat up to 450 degrees Fahrenheit at Mach 2.7 while flying eleven miles above the ground in air that averages minus seventy degrees Fahrenheit. Yet the higher strength-to-weight ratio of its basic material—6A14V, an alloy of ninety percent titanium, six percent aluminum, and four percent vanadium—is expected to exceed the 50,000-hour lifespan set as a minimum requirement by the Federal Aviation Agency. Also, tests on the wing pivots conducted by Boeing already exceed the number of operations experienced during the aircraft's full lifespan without showing any appreciable deterioration.

Enhancing the economics of the SST's longevity will be its productivity—at least four times better than the best current subsonic aircraft, better than twice that of the competing Concorde, and even consider-

ably above the coming first-generation of Jumbojets of the 747 variety.

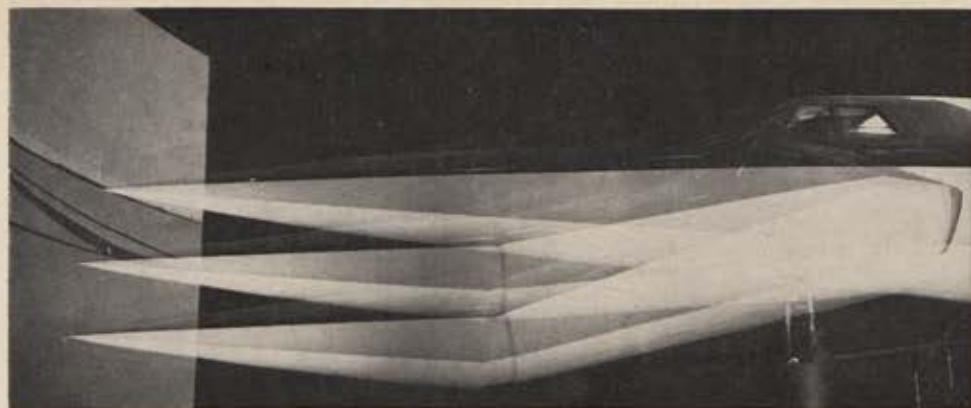
In direct operating costs, calculated by Boeing under the applicable current International FAA rules, the SST will produce passenger seat-miles at about 0.9 cents compared to about 1.2 cents for the 707, 1.4 cents for the Concorde, and about 0.8 cents for the 747.

Current market studies indicate that well over 1,000 and perhaps as many as 1,800 SSTs will be built by 1990 and that they will produce over half of the total revenue passenger-miles by that time. Costing at least \$35 million per aircraft (compared to about \$16 million for the Concorde) the SST program may yield 50 billion in 1967 dollars. This figure could "escalate" if second-generation jumbo SSTs with 500 or more passengers should become economically viable, and if special medium-range SSTs were eventually to enter the market.

It will cost perhaps over \$4 billion to bring the American SST into passenger service, and over \$2 billion will have to be advanced in the form of government funds, which will be recouped with interest through airline royalties.

Boeing President William M. Allen has stated that all fifty states eventually will share in the production of the giant aircraft. Major subcontractors named so far are Fairchild Hiller's Republic Aviation Division, North American Aviation, Northrop Corporation, The Martin Company, Avco Corporation, and LTV Aerospace Corporation's Aeronautics Division.

As for the supply of titanium, the SST's basic material, it is plentiful. Initially produced only in Australia, the metal now is extracted from beach sand in Florida.



"Double-articulated" nose of Boeing's SST provides pilot visibility better than available in contemporary jetliners for takeoff and landing. During supersonic cruise the movable, double-jointed nose is arranged in completely streamlined position to diminish drag. The 2707's lift/drag ratio is said to be about 15 for subsonic flight and 8.2 or better in supersonic cruise.

The Powerplant

The SST needs more power than any existing commercial or military aircraft. Each of its GE4 engines will initially produce at least 60,000 pounds of thrust. Static tests under simulated conditions have already produced over 52,000 pounds of thrust. Gerhard Neumann, General Electric's vice president in charge of the company's propulsion division, has stated that within five years from the day of actual production the engine will increase thrust by a "minimum of twenty percent" and that it will be inherently capable of producing sufficient power for Mach 3 cruise.

The SST engine is about twenty-five feet long, has a six-foot diameter, and is an augmented turbojet, normally called an afterburner type. Its thrust output will roughly double that of the most powerful engine currently in operation—that of the XB-70. The GE4 has nine stages with variable stators in its compressor and a two-stage air-cooled turbine. The turbine inlet temperature, officially given at "above 2,000 degrees F," is in reality estimated to come close to 2,300 degrees. Each GE4 is expected to cost around \$1 million, but the exact amount has not been announced. To

General Electric, winning the SST contract may mean \$4 billion to \$6 billion in business over the next two decades. According to industry sources, the GE engine is considerably cheaper to develop and build than the duct-burning Pratt & Whitney turbofan engine with which it initially competed. General Electric spokesmen claim that their engine has climb, acceleration, and supersonic fuel consumption advantages that "outweigh" the Pratt & Whitney subsonic specific fuel consumption advantage.

As for noise generation, GE states that the GE4 meets or beats the FAA objectives except for airport sideline levels on takeoff with afterburner operational.

According to Mr. Neumann, the GE4 engine has "an amazing peak level of efficiency of forty-two percent—nearly a 100 percent increase over the best of present engines." This he attributes to sophisticated turbine metal cooling, which makes it possible to operate the engine hotter without increasing the actual turbine-blade temperature.

General Electric expects that future engine refinement work will yield SST powerplants of greater thrust-to-weight ratio, increased specific fuel consumption, lower maintenance costs, and even better reliability than the initial GE4 type.—END

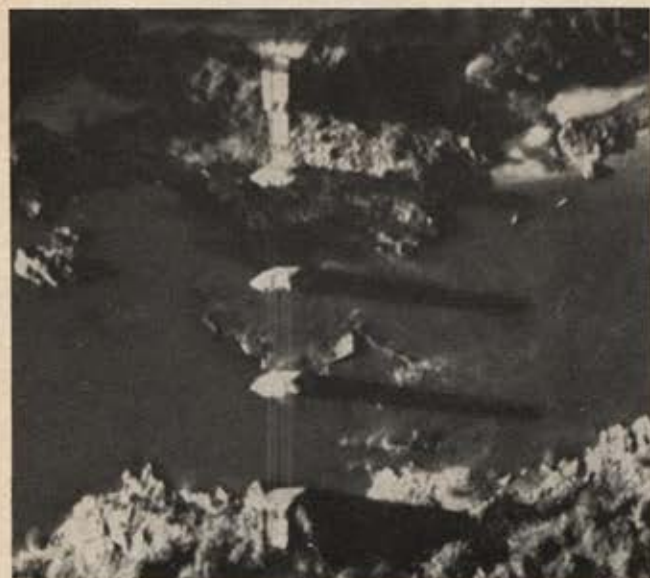
Designed for the late 1970 time period, Boeing's SST will have many ultramodern features such as color television and ten-channel radio information and entertainment channels. Special design of overhead console will permit storage of carry-on luggage, eliminating annoying under-seat storage required in present equipment for safety reasons. On-board telephone and television communications facilities are being considered for the convenience of the passengers.





In order to carry a full load of conventional bombs to targets in South Vietnam, B-52 Stratoforts must be refueled en route. Above, a B-52 completes air refueling from a KC-135 tanker. The bombs shown on the aircraft are 750-pound conventional weapons. The huge jet is capable of carrying some 60,000 pounds of destructive power on its wings and in bomb bay.

THE AIR WAR IN VIETNAM



Communists stretched cables across bombed-out Ban Pa Hu-one bridge in North Vietnam. Wooden sections were pulled across cables at night for foot and truck traffic. Recon photo above shows what bridge looked like during daytime.

An AF/SD Photo Feature

Air Force pilots and crews, flying everything from prop-driven A-1Es to huge B-52 jets, continue to drop tons of bombs on Viet Cong targets in the South and supply lines in the north, while, on the ground between missions, they try to help the Vietnamese people.



A2C Ronald L. Ramey of Kingsport, Tenn., uses his singing and guitar playing to gain the confidence of the children at Montagnard village of Plei Bon Bao. He and others from Pleiku helped construct a cement spillway for the village.



Bristling with bombs, a B-57 Canberra bomber heads toward enemy target in South Vietnam. A flight of two B-57s recently killed fifty-three VC, destroyed twenty-seven buildings.



Skyraiders fly in easy formation en route to a strike in South Vietnam. Skyraider pilots fly strikes in both North and South Vietnam. They also fly reconnaissance missions.



Using the Low Altitude Parachute Extraction System (LAPES), an Air Force C-130 Hercules crew delivers a load of supplies to the US Army's 1st Cavalry Division (Airmobile) at An Khe. With LAPES, platform-mounted loads are pulled from the rear of a transport plane at an altitude of about five feet. System is designed for resupply in narrow drop zones.

Although the military may appear too rigid to cope with the dynamic changes in world politics and technology, in fact there are many "liberals" in its ranks. These liberals are as educated and capable of seeing political and technological subtleties as DoD civilians, contends the author, himself an experienced, high-level military planner, author, and former Assistant Professor of History at the Air Force Academy, who is now at the RAND Corporation . . .

The Liberal Challenge in the Military Profession

Lt. Col. William E. Simons, USAF

Reprinted, with permission, from the Air University Review, July-August 1966 issue.

IN CERTAIN respects the military profession appears ill-suited to cope with the dynamic changes in the world political and technological environment. Its bureaucratic and hierarchical organization has often tended to reward parochial viewpoints and foster institutionalized routine. Its dependence on public support has sometimes served to discourage bold and timely changes in its internal policies. Its commitment to optimum security has made it resistant to innovations in defense concepts and to nonmilitary initiatives in strategy development. These apparent incompatibilities with an environment of change highlight a fundamental issue: Can the military profession, never before so influential in American society, adapt to the liberal values of that society and still retain its essential character?

Though the military traditionally has emphasized disciplined routine and conformity, it is today experiencing a vigorous dialectic. Within its ranks has emerged a liberalist element that challenges reliance on the established military maxims and seeks alternatives to the traditional approaches to defense issues. These spokesmen urge the encouragement of individual intellects and creative talents within the profession, in a constant search for better solutions to technical military and politico-military problems. As a result, the officer corps of the several services today embody two distinct and competing attitudes toward their responsibilities for national defense.

This dilemma of purpose has been revealed in many different ways. It showed up during the spring of 1965 in the concluding statement of the White Committee, which investigated the cheating scandal at the Air Force Academy. On the one hand, the committee found desire for a spirit of free inquiry to excite the intellects and encourage the critical faculties of Academy students. On the other, it found dedication to the development of the traditional character and leadership traits leading to disciplined service in a military organization. In *The Professional Soldier* (1960), Pro-

fessor Morris Janowitz observed a similar dichotomy of attitudes within the services at large. One school of thought was seen stressing the heroic martial virtues, the punitive role of military forces, the value of standardized career patterns, and "absolute" doctrines for employing arms. The other was described as emphasizing managerial skills and criteria, an adaptive policy-oriented role for military force, the need for individualized careers, and "pragmatic" approaches.

Such confrontations are not unusual in corporate groups. In *Soviet Strategy at the Crossroads* (1964), RAND scholar Thomas W. Wolfe discusses the doctrinal and strategic debates under way within the Soviet defense establishment. These debates continue between groups described as "traditionalist" and "modernist," or viewpoints predominantly military and predominantly political. On a broader scale most political societies, including the United States, have engaged for years in what Michael Howard has called a "dialectic between freedom and security." On one side of the dialectic are those who see great evil in hasty, "safe" action which may encroach on individual liberties, who believe that force must be used sparingly, and who regard a plurality of views as a source of progress and durability. On the other side are those who see "foreign" forces as the primary threat, who believe in generous applications of coercive power in combating these forces, and who would subordinate all other motives to a singular will promising to maintain conditions of security.

To generations of Americans, the military has appeared to stand on only one side of this debate. And, until the last decade or so, leading members of the military profession have spoken and acted rather consistently in ways to confirm this view. Indeed, it is this fact as much as any other that has been responsible for the peculiarly American kind of concern for civilian control over the military. Yet an objective review of this historical issue will reveal that actual seizure of civil power by the military (a fundamental concern

for so many European peoples and British colonists) has never been a problem in the United States. Not since 1787, when the Society of the Cincinnati offered George Washington kingship and the support of an armed aristocracy, have American military officers ever again represented a threat to our political institutions. Moreover, it has become commonplace to observe that ex-career officers who have attained the nation's highest offices have carefully avoided uses of power that would appear authoritarian or dictatorial. Without historical evidence of a civil threat from the military, one is left to conclude that the American concern for civilian control has been conditioned largely by mistrust of military attitudes and mental processes.

The judgment of the military professionals is naturally constrained by concern for national security, and properly so. If this were not so, it is doubtful that they could perform their unique functions in modern society. Incidental to this issue, much has been written about whether or not a "military mind" actually exists. Proper perspective is supplied by Charles Burton Marshall in his observation that a military viewpoint is essential. As he states, the military profession has both the "prerogative and the obligation" to view reality with a distinctive set of attitudes.

A key to these attitudes is found in Janowitz's view that "the development of a rational approach to innovation cannot supplant an uncritical willingness to face danger—the essence of the martial spirit." Modes of service behavior are necessarily shaped to instill habits and attitudes that will best sustain reliable performance in battle. Especially hazardous or complex technical operations, such as the emergency dive of a submarine, require automatic response to signals or verbal commands, allowing almost no interpretation of the order. Individual desire to respond to impulse or follow an intuition must be subordinated to the course of action most beneficial for the entire crew or unit. To sustain this essential combat point of view, officers are encouraged to regard organizational loyalty and obedience to proper authority as the highest military virtues.

Related to these requirements are the kinds of training and testing exercises in which military organizations continually engage. Considerable emphasis is placed on repetitive, routine drills which, though perhaps intellectually dulling, are nevertheless necessary for perfecting combat techniques and teamwork. Where men's lives are at stake, standardized practices, arrived at empirically under combat conditions, must be established. Thus, infantry platoons constantly engage in bayonet drill and typical field problems. Strategic bomber crews regularly fly practice navigation and bombing missions. In such exercises a paramount objective is to develop procedures that are as simplified and free of confusion as combat situations will permit. Quick reaction and disciplined routine are primary goals, and conformity with approved practice is encouraged.

Unilateral service doctrines also tend to constrain military attitudes. Branches of the military are unique among professional groups in that each has developed a rather formal body of rationale as a guide for its operations and policies. This doctrine provides funda-

mental concepts and criteria against which new ideas can be evaluated. However, doctrine can also act as a force for complacency and inflexibility. This is particularly true if it is regarded as providing adequate answers for every service-related controversy. Its value may be more apparent than real, its rhetoric more assuring than pertinent, as several instances will demonstrate:

- In early 1886, Alfred T. Mahan derived historically the concept that the proper use of naval resources lay in employing a battle fleet to seek out and destroy the warships of the enemy. Adherence to this doctrine by the Navy Department in 1916-17 was a primary factor in its near-failure to provide escort vessels for the convoy operations needed to combat German submarine warfare.

- In World War I, the High Command of the French Army stuck doggedly to the doctrinal principle of *offense à outrance* ("offense to the death") which had been developed and taught in its war college following the Franco-Prussian war. Repeatedly ordered advances in the face of withering German machine-gun and artillery fire resulted in the slaughter of more than a million French infantrymen and eventually led to a mutiny in the field.

- During the struggle of the Air Corps for recognition within the US Army in the 1930s, strategic bombardment was emphasized to the detriment of other air missions, and the conviction grew that precision bombers could operate in daylight without fighter escort. Penetrations to deep German industrial targets, in accordance with this doctrine, brought such serious losses in October 1943 that the strategic offensive was halted until February of the next year, when escorts could be provided.

Military history offers many such examples of a service doctrine dogmatically applied despite changes in the conditions which spawned it.

Unilateral service doctrine tends to be self-perpetuating, and its treatment in the curriculums of professional military schools fosters the trend. This can be dangerous in an era when combined arms and joint service operations characterize conventional warfare and when whole nations can be destroyed in a few hours with nuclear weapons. Yet parochial concepts, developed when naval weapons were employed against navies and ground forces encountered only other ground forces, continue to hold sway. As a result, officers desiring to think about war realistically are often impaled on their own service's doctrinal horns.

Today's military professionals need influences to offset the effects of institutionalized routine and approved doctrine. The technical sophistication of weapons and the complexities of strategy require productive criticism and receptivity to new ideas. As in no other period of its history, the American military profession today faces responsibilities that demand officers with open minds, with a point of view reflective of liberal values.

Such a point of view is based on an awareness that methods, beliefs, and standards first learned—even in one's profession—are not necessarily the most appropriate ones. Thus the liberally oriented officer is pre-

(Continued on following page)

pared to make fresh judgments, each one with full awareness of context, perspective, uniqueness, and the suitability of different criteria for objective evaluation.

- Awareness of *context* enables the liberal man to view events or issues in terms of the surrounding circumstances and the effects which they will have on these circumstances. As a result, any action he believes necessary will be taken with full awareness of probable consequences. For example, engineering decisions with regard to a transportation system cannot be divorced from costs or from impacts which the system might have on its users.

- *Perspective* enables the liberal man to see problems and events as products of their formative stages. He can analyze causal factors and understand why a problem exists. If successful, he is likely to develop fundamental and lasting solutions rather than those that cope only with surface or temporary aspects. For example, problems arising between factions in an organization cannot be solved effectively without attention to the forces that led to initial polarization of these groups.

- Being aware of *uniqueness* helps the liberally oriented person determine quickly whether or not the special features of a problem are crucial. If they are not, he can apply solutions known to have been successful in the past with a minimum of further deliberation. If they are, he knows where to devote his energies and what kinds of analysis are likely to be appropriate.

- The man who recognizes that *many different criteria* are suitable for evaluating different issues is the man best equipped to judge each issue or event on its merits. He is least likely to rely on doctrinaire rationale to meet a crisis. Being aware of a variety of possible approaches to a problem, he is likely to apply the kind of analysis and take measures most appropriate in each instance.

These four qualities of mind already characterize an increasingly significant number of our professional military officers. It is this group that represents the liberalist side of the current dialectic. Evolving amidst the traditional trappings and bureaucratic inertia of the profession, however, this group in its emergence has been upstaged by the more dramatic alterations in Department of Defense organization and management procedures. Actually the two developments are mutually supporting. On the one hand, the liberalist element within the military has helped provide much of the raw study data on which top management decisions have been based and has served as a primary source of talent for implementing the resulting innovations. On the other, among more liberally oriented officers the new managerial and policy-making procedures have encouraged fewer parochial concepts for employing military resources. Unfortunately, however, encouragement has not often been accompanied by recognition.

In point of fact, significant numbers of the officer corps are better prepared to cope with the technicalities and policy issues of modern defense than some of their critics have feared. In 1956, for example, Denis Brogan asserted that the higher civil servants in Brit-

ain's Admiralty and War Office were better equipped to deal with the new role of the scientists in defense matters than were "the military bureaucrats of the Pentagon." His explanation: "Oxford and Cambridge provided a better education for this function than did Annapolis or West Point."

Since that time, however, many of the educational shortcomings of our service academies have been remedied. Opportunity has been provided to pursue academic areas of individual interest in greater depth, and the quality of instruction has been upgraded by higher faculty standards. Officer products of these institutions and of many civilian colleges are being sent by the thousands each year to the same graduate schools from which civil servants in the Department of Defense, Agency for International Development, and State Department are recruited. In addition to professional skills, these officers acquire the same kinds of expertise and academic background as many DoD civilians who hold high-level positions. Moreover, many of those who serve as faculty members at the service academies and staff colleges are able to effect the rare combination of practical military experience and extensive theoretical contemplation which give rise to unusual insights.

This reservoir of military talent, combined with the kinds of intellectual influence most likely to encourage critical attitudes toward traditional service constraints, suggests a need for careful reevaluation of typical approaches toward civil-military relations. Neither the American people nor their authorized officials can afford to regard the military profession strictly as an ultraconservative body whose views will threaten liberty itself if given too large a voice in national policy determination. To deal summarily with the military as one homogeneous group under a uniformly applied doctrine of civilian control is to ignore the very real differences in attitude and viewpoint which exist among members of that body and their potential for a broader, more constructive contribution to national affairs. The eventual effect will be to stifle the emergence of an effective leadership group within the profession and instead encourage narrow emphasis on techniques and total obsession with security that are so inimical to a truly liberal and vital society.

The military profession itself needs to take heed. The problems of fashioning an appropriate defense for the future are complex. To solve them demands a spirit of innovation, a knowledge of fundamental issues, and a rational objectivity far more extensive than in years past. Unless the services encourage and give recognition to their "liberals," the functions requiring these qualities of mind are likely to pass more and more into civilian hands. Witness the increasingly large roles played in recent years by contract study institutes and "defense intellectuals" in the shaping of military policy. If the military profession should encourage even more reliance on civilian consultants by failing to encourage similar study efforts and policy recommendations on the part of its liberalist element, both the profession and the vital balance in our national policy-making process could suffer.—END

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How A Nuclear Nonproliferation Treaty Could Work

By Lt. Gen. Harold C. Donnelly, USAF

DIRECTOR, DEFENSE ATOMIC SUPPORT AGENCY

Writing on the subject of nuclear weapon proliferation in our August 1966 issue ("Learning to Live with Nuclear Spread") and our October 1966 issue ("Softening the Impact of Nuclear Spread"), political analyst David Robison argued that nuclear spread is probably inevitable and that, rather than stress nonproliferation treaty approaches to the problem, the United States should concentrate on political/military policies to make the best of the inevitable.

In the article below, General Donnelly argues that a nonproliferation agreement can work if it is universally adhered to and adequately policed through international inspection goals. General Donnelly's article is excerpted from his address "A Military Look at Nuclear Proliferation," to Pittsburgh's World Affairs Council, Nov. 17, 1966.—THE EDITORS

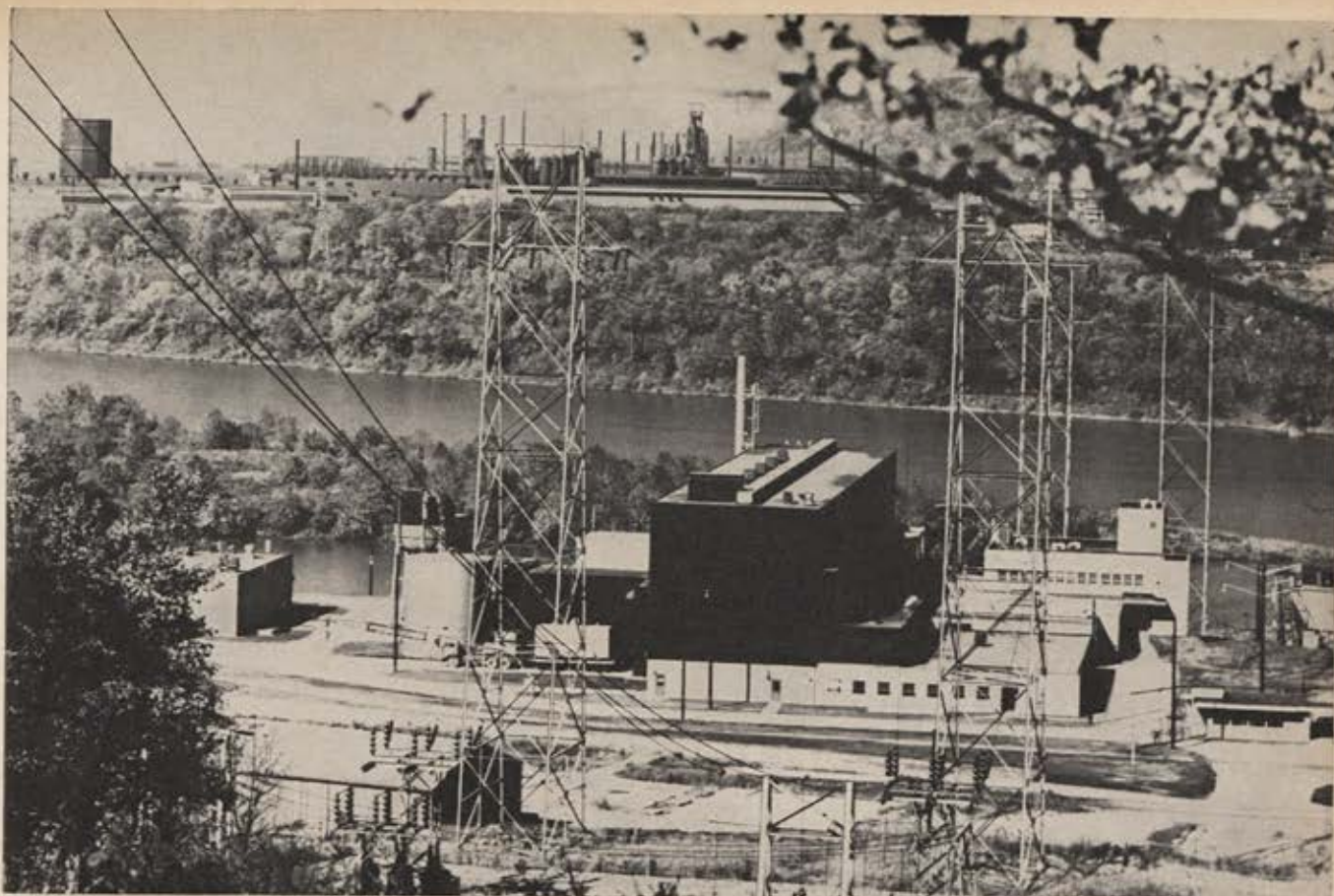


General Donnelly has been Director of the Defense Atomic Support Agency, Washington, D. C., since January 1964 and received his third star at the same time. In that post he guides DASA's role in underground nuclear testing and maintenance of nuclear laboratories and facilities. A veteran staff officer, General Donnelly has had extensive experience in nuclear matters, and served as Assistant Deputy Chief of Staff, Research and Development, Hq. USAF, prior to his present assignment. He is a native of Lynn, Mass., and was graduated from West Point in 1933.

AGREEMENT on nonproliferation [of nuclear weapons] is so meaningful to this nuclear age that all other arms-control proposals seem insignificant by comparison. And yet we must be realistic and recognize that if we ultimately do reach agreement, signatory nations will adhere to it only so long as adherence serves their national interests. If a majority of nations accepts and adheres to the agreement, however, the potential threat to the world will have been retarded. Nations will find it difficult to take the political decision to go nuclear once they have undertaken the dual restraints of the Limited Test Ban Treaty and a nonproliferation agreement. World opinion will condemn, as it has since the Limited Test Ban Treaty, those nations which refuse to sign.

The likely course for the nation which does not sign, or which after signing does not adhere, would be to develop nuclear weapons independently. In discussing this possibility, we can look at the three basic factors which such a nation would have to consider. These are nuclear technology, the need for a source of fissionable material, and funds. The nation that has both the technology and the material, and which is willing to put up the money, needs only national will to produce an independent nuclear capability.

Controlling the transfer of technical knowledge in the nuclear field is virtually impossible. The basic knowledge is available to scientists the world over. Any nation that has the technological and industrial capability to develop nuclear powerplants has the



—Photo courtesy Duquesne Light Co. and AEC

The world's first full-scale atomic power station is this plant at Shippingport, Pa., a joint project of the US Atomic Energy Commission and Pittsburgh's Duquesne Light Company. Forty-eight nations, including some in the Soviet bloc, are working on nuclear reactor programs, from which, author notes, rudimentary nuclear weapons could readily be produced.

means to fabricate rudimentary nuclear weapons. The development of reactor programs is expanding rapidly all over the world. Such programs exist today in forty-eight nations, including the Soviet bloc. They include 303 separate reactors, either in operation or under construction. Thus, obtaining the necessary knowledge should present no problem to the nation bent on achieving nuclear arms.

With technical knowledge thus readily available, and assuming a willingness to invest the large scientific and financial resources necessary, a source of fissionable material appears to be the most important factor to a nation bent on developing an independent nuclear weapons capability.

The simplest nuclear weapon requires the availability of enriched uranium or plutonium, which are presently produced in gaseous-diffusion plants and nuclear reactors respectively. The gaseous-diffusion process is expensive and technologically complicated. The production of enriched uranium, therefore, requires a great capital investment, vast electrical power, and a large and complicated manufacturing plant. Such production is well beyond the current capability of most of the nonnuclear nations.

Nations aspiring to a nuclear weapons capability are most likely to turn to nuclear reactors, the source of plutonium. This source is available through international programs to develop peaceful uses of nuclear energy. Reactor-produced plutonium may then be used directly in a crude weapon, or the plutonium can be

purified for use as an ingredient in a more sophisticated weapon.

Generally speaking, the greater the power level of a nuclear reactor, the more plutonium it produces. As world production of nuclear power increases, therefore, plutonium production increases. Let me give you some estimated figures based on Atomic Energy Commission data.

In 1966, free-world reactors, excluding those of the United States, could produce about 275 kilograms of plutonium 239. The Shippingport reactor [in Pennsylvania] . . . for example, could produce an estimated sixty-six kilograms. Looking ahead to 1970, we can expect an increase by a factor of about five. [By then] free-world plutonium production will have reached almost 1,400 kilograms. By 1982, we can expect free-world production outside the United States to have reached an annual rate of about 20,000 kilograms. Cumulative production could be in the neighborhood of 100,000 kilograms by 1983!

Scientists tell us that we can make a crude weapon with five or ten kilograms of plutonium. Hence, enough plutonium could be produced in the free world by the middle 1970s to create a significant number, a very significant number, of nuclear weapons.

A comprehensive test-ban treaty has been proposed along with other arms-control measures as a means to halt nuclear proliferation. US policy, as stated in the President's message of January 27, 1966, to the Geneva

(Continued on following page)

Disarmament Conference, supports such a treaty. Although it has merit as another step to ultimate world stability, we must look at such a treaty objectively in the cold light of our own national interests. Our attitude toward an international agreement banning all nuclear weapons tests must consider adequate inspection and detection safeguards, as the President stated. It also must consider that *a nuclear weapon can be developed without testing*. Our own experience has proved this. . . .

We dropped the only two atomic bombs ever used in war, on the Japanese cities of Hiroshima and Nagasaki. The Nagasaki bomb, the second one we used, had been pretested. It was a system exactly like the device we detonated in New Mexico. The first bomb, however—the Hiroshima weapon—employed a different system. The Hiroshima bomb had never been tested. Both weapons were crude in terms of present technology, but it will be remembered that they were most effective.

The Nagasaki and Hiroshima bombs were in the twenty-kiloton range. It's possible today to develop a one-megaton weapon using a smaller but similar system to the Nagasaki bomb. Such a weapon, although large and heavy, could be delivered by aircraft or as the warhead of a missile. We cannot guess, however, whether any nation would stockpile large numbers of such weapons without proof-testing the system. Certainly the production of such weapons would be expensive, presenting a significant economic drain on poorer nations. The development of more sophisticated thermonuclear weapons would probably require testing.

The question then becomes how to control the rapidly developing source of weapons material available from nuclear reactors. How do we ensure that such material will be applied to peaceful purposes? Fortunately, there is a good chance that this can be accomplished.

. . . The United States has promoted peaceful uses and has provided many nuclear reactors throughout the world. This program for international cooperation was initially carried out through bilateral agreements with individual countries. These agreements included preventive clauses regarding weapons development and, of course, provided for inspection. More recently, some of our programs have been channeled through the International Atomic Energy Agency and the European Atomic Energy Community. As our old bilateral agreements expire or enter into renegotiation, the US is transferring its control responsibility to these international authorities. The aim of US policy is the evolution of a single worldwide safeguards system.

In the past few years, a system of international controls to prevent the diversion of fissionable materials to weapons development has been put into practice by the International Atomic Energy Agency. The Agency, which supervises many international peaceful-use programs, applies these safeguards to both reactors and materials. Thus, while not restricting peaceful uses, international rules and regulations are in effect that provide reasonable assurance against the

diversion of facilities and fissionable materials to weapons production.

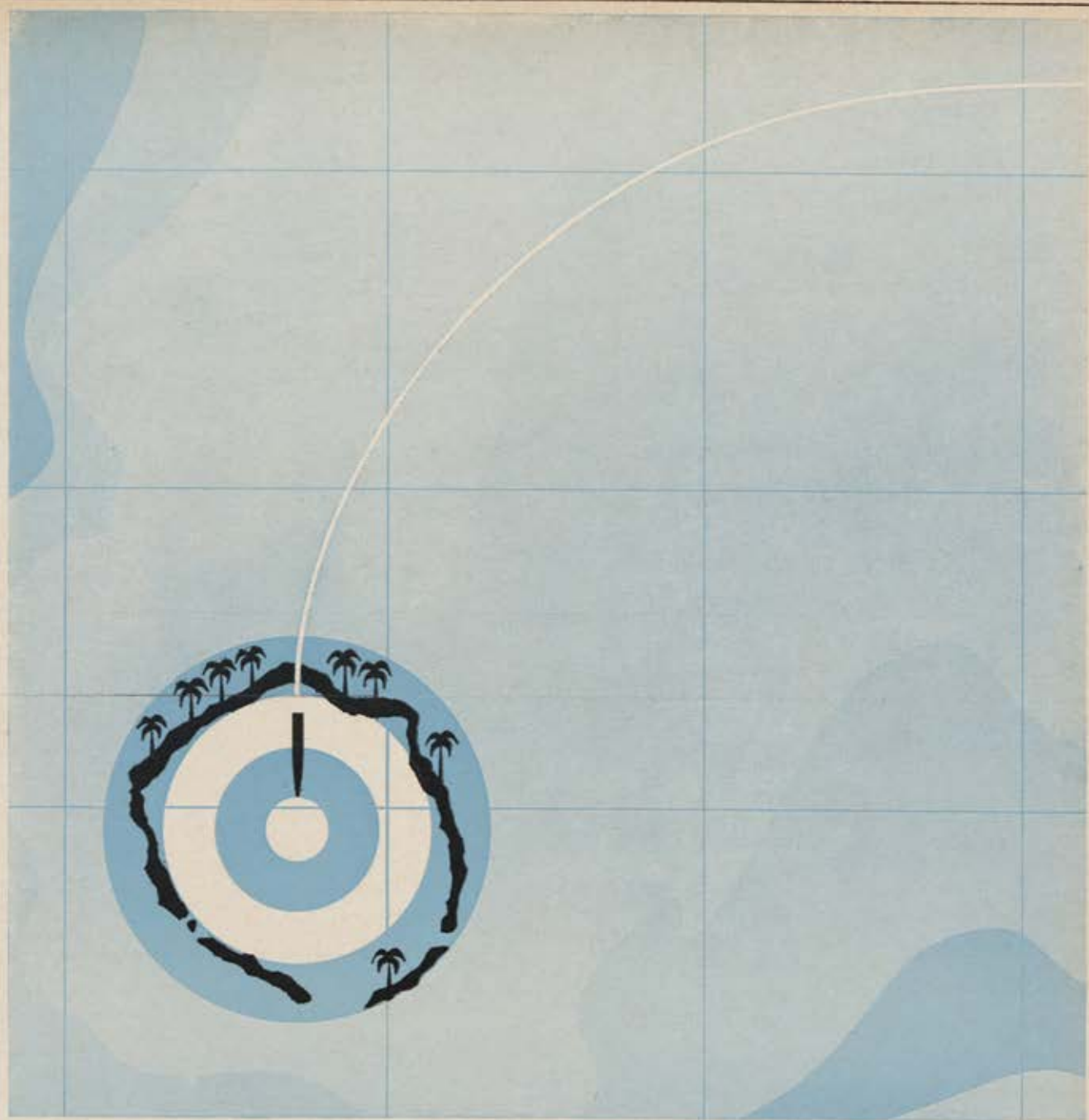
The United States exercises tight accounting and control of materials used domestically or exported. We use our own Atomic Energy Commission safeguards system in some instances and depend on the international systems in other cases, since they are considered to be equally effective. The International Atomic Energy Agency applies its safeguards system to both the reactor fuel it supplies and the plutonium produced by the reactors it supports. The Agency's safeguards system operates with the cooperation and encouragement of both the United States and the Soviet Union. This program appears to be a unique existing base which can be expanded to apply advanced inspection procedures as the number and volume of nuclear powerplants increase throughout the world.

In addition to proposing a Nonproliferation Treaty with acceptable safeguard provisions, and a Comprehensive Test Ban Treaty, the United States has proposed a number of other arms-control measures designed to prevent the further spread of nuclear weapons. We have proposed measures to verify a halt in the production of fissionable material for weapons, to transfer large quantities of such material to peaceful uses, and to verify a freeze in the production of offensive and defensive strategic delivery vehicles. The United States is determined to continue its efforts to conclude agreements that will prevent the further spread of nuclear weapons and lead to a more secure world.

My discussion of the military viewpoint on proliferation has of necessity been woven into the fabric of the US diplomatic effort to seek agreement on halting the nuclear spread. I've subordinated the military viewpoint which, after all, is the "big stick" that Teddy Roosevelt added to his advice on walking softly in international affairs. Our nuclear deterrent is our "big stick." Even though it's a stick we hope never to use, the military viewpoint requires us to look at international relations realistically.

Thus, while we must give attention to maintaining our own defense, we can look also at the difficulties that a nonnuclear nation must surmount before it can achieve a nuclear weapons capability. We also must be continually aware, however, that weapons technology is widely available and that possession of an unsafeguarded nuclear reactor provides a source of fissionable material for weapons. And we must acknowledge that the pressures of even limited war can build to a point where a nuclear power might be tempted to share its capability with a nonnuclear ally.

A nonproliferation agreement accepted by and adhered to by all the nations of the world can provide a truly effective means by which the spread of nuclear weapons can be halted. Adherence to international inspection controls would abet a nonproliferation agreement. There also is the fact that peaceful atomic uses themselves, although providing the materials for nuclear weapons, can help us create a world of plenty in which aggression could offer no reward.—END



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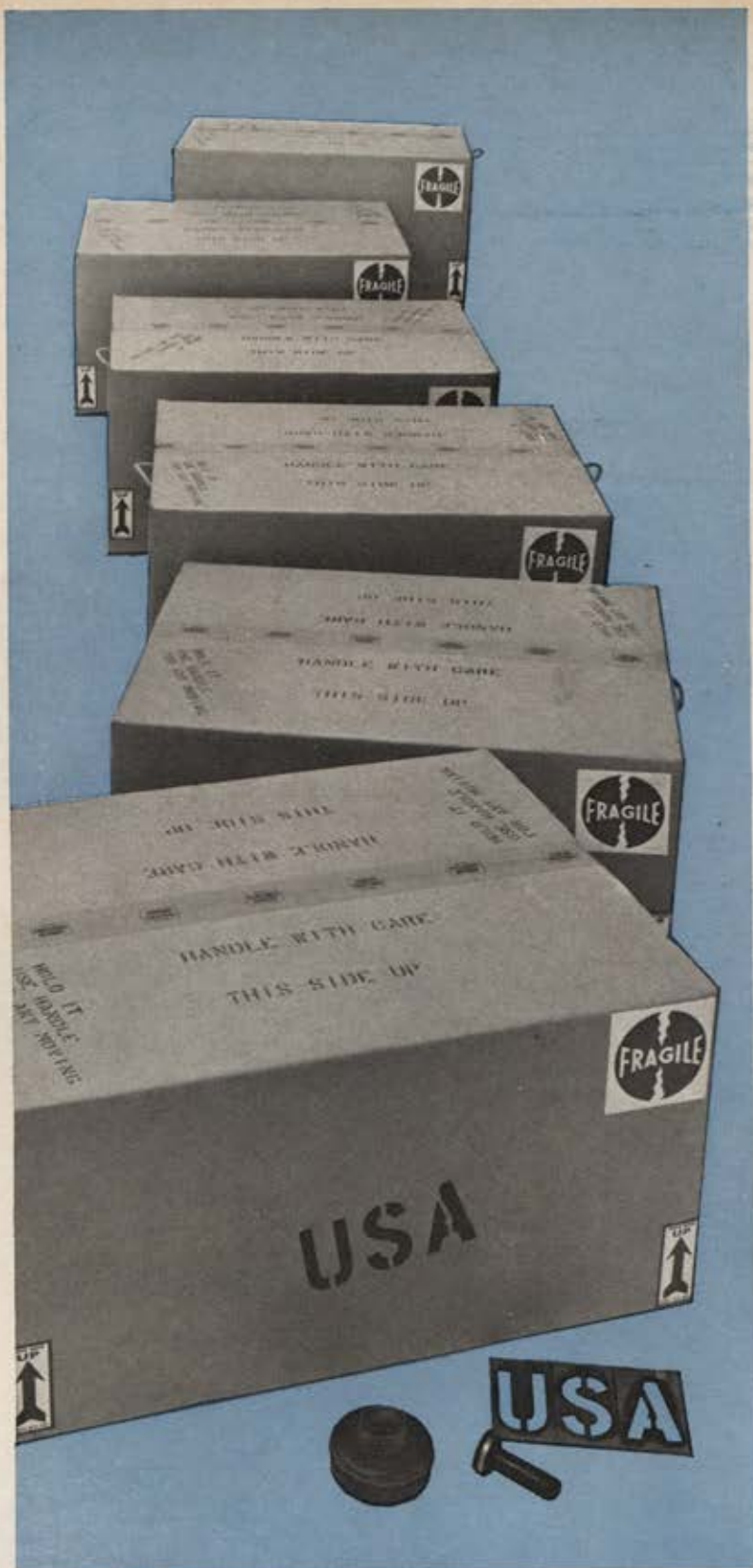
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Speaking of Space

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Although the President's State of the Union message avoided mention of space programs, military or civilian, no major cutbacks in the space effort are expected. The moon-landing program will continue as planned, and the Air Force's MOL program should get increased funding.

"Kelly" Johnson: A Worried Planner

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Space as a Pacesetter for Technology

By Karl G. Harr, Jr. 66

We must recognize the space effort for what it is, the spearhead of our total technological advance. Understanding that, we will see its contribution to over-all national progress in an age in which technological lag can cost any nation dearly.

Nuclear Power: Clean and Abundant Energy for a Space-Age World

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The AEC Chairman reports on prospects for the nonmilitary use of nuclear power to meet the huge energy requirements of an expanding world population.



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Speaking of Space

No major cutbacks in the ongoing space program appear to be in prospect in the face of fiscal pressures of the Vietnamese War. Instead there will probably be a continuation of the leveling off of the past few years. On the military side, there are indications of increased funding for the Air Force Manned Orbiting Laboratory . . .

Space in Fiscal 1968: Still on the Plateau

BY WILLIAM LEAVITT

Senior Editor/Science and Education

WASHINGTON, D. C., JANUARY 12

IT WAS a different President Johnson who delivered the long-awaited and lengthy State of the Union message. For the first time he spoke of priorities. Gone was the insistence that somehow we could afford to press ahead with equal vigor on all fronts: the war in Asia, the War on Poverty at home, advanced technological programs, the rebuilding of cities, and all the rest.

Except for a brief allusion to the proposed treaty to outlaw weapons of mass destruction in the void, there was no mention at all of space in the State of the Union message. But as observers were quick to point out there was no mention of a number of other important current programs, including the supersonic transport project, oceanography, and science and technology in general. Do these omissions signify major cutbacks all along the science and technology line? The answer is probably no. Rather, what we are seeing is the President's preoccupation with Vietnam and his strong desire to maintain at least some momentum in his War on Poverty, both efforts which have suffered sharp criticism for the past year. Having asked for a six-percent surcharge on taxes, which he may or may not get from a recalcitrant Congress that is distinctly economy minded, the President is admitting what so many observers have been saying for months—that even this rich country has fiscal limits, and that, aside from policy pros and cons, the money question is becoming unavoidable. Thus the allusion to priorities in the President's message.

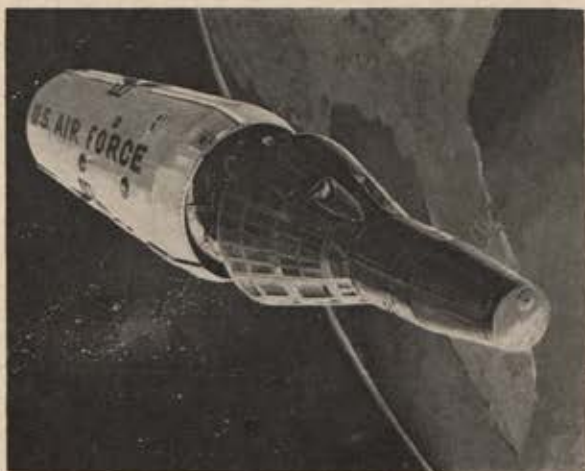
Where does the space effort stand in all this? Since the President's proposed Fiscal 1968 budget is not yet known in detail, it is difficult to say with certainty which space projects will suffer the most and which the least as a result of the tight money situation. It is important to point out that although space was not mentioned positively in the State of the Union message, neither was it listed as a spe-

cific area where great savings were to be effected.

There is no thought, it is known in the Administration and at the National Aeronautics and Space Administration, of slowing down or cutting back on the Apollo moon-landing program. Although some critics of the space program have urged the President to reduce the Apollo commitment, he wisely did not heed such counsel. The program has long since passed its



For President Johnson, there is irony in the fact that to meet the costs of a shooting war in Vietnam and to maintain momentum in his War on Poverty, he has had to lower priorities in the space program he helped build.



The Administration, in its Fiscal 1968 budget request, is expected to ask for significantly increased funding for the Air Force's Manned Orbiting Laboratory project, which, under heavy secrecy, is proceeding in its R&D program. Last year MOL funding requests were held down, but to get it going for 1969, dollars are needed soon.

halfway mark and is three years or less away from achievement. An enormous waste of money and talent would have gone down the drain if Apollo, at this point in time, had been truncated.

The expectation is that in his Fiscal 1968 budget the President will ask for some \$5 billion authorization for NASA, and that in the request there will be sizable funding for NASA's proposed Apollo Applications program, which would use Apollo capsules and Saturn booster hardware for a wide-ranging series of manned and unmanned earth-orbital research and survey flights. There are also indications that there will be requests for funding of the proposed unmanned Voyager probing of Mars to begin in 1973, which is still six years away.

Five billion dollars, give or take a little, is an enormous amount of money. But the fact that it is on the same general order of last year's authorization request shows that the Administration, pressed by Vietnam, has been forced to continue its "plateauing" of the over-all NASA effort. Since NASA has had to spend the major portion of its money the past several years on its expensive manned spaceflight programs, something has had to give. What gave initially was the ambitious unmanned scientific space-exploration program that the non-Gemini and non-Apollo people at NASA had hoped to get going. The sag seems now to have extended to some aspects of the manned flight program at NASA—for example, NASA's hopes to get a large space-station program under way, as well as a commitment to manned exploration of Mars. Choices have had to be made. Not surprisingly, the emphasis has been on ongoing efforts like Apollo and direct follow-ons such as Apollo Applications.

On the military space side, the indications are that the Air Force Manned Orbiting Laboratory will at long last get a substantial increase in funding, perhaps as much as \$400 million, as compared with the

\$150-odd million sums that have been asked for the past two fiscal years. It is even possible that the military space budget request will be higher in total than the \$1.6 billion asked for last year.

One of the problems of analyzing MOL funding is the fact that the effort is so secrecy bound. Even if the request for MOL is substantially larger than in previous years, that fact may not be as significant as it appears at first glance—the reason being that since the program is so secret, no one on the outside is at all sure how much of the money appropriated in the past couple of years has actually been spent. Thus, there is the possibility that at least some new money may really be old money. In any case, so far as can be ascertained, MOL—a new departure in strategic reconnaissance—is proceeding quietly toward its announced 1969 mission target date. Certainly, if flights are to take place in 1969, hardware development has got to start pretty soon.

The year 1967, without doubt, will be a difficult one all around. On the space front, there is the unnerving prospect that this year, in most ways a marking-time period for us, could feature spectacular Soviet achievements. November 1967 is the fiftieth anniversary of the Bolshevik revolution. There are those who believe strongly that the Russians simply cannot let this year of all years pass without a major space feat.

There are two obvious possibilities. The Soviets might attempt to construct a large manned earth-orbital space station. They have the booster power to do so and their life-support abilities are as good as ours, so far as anyone can tell.

Or, and somehow it seems to this observer more likely, they might try a manned circumnavigation of the moon. This would be even more spectacular than a manned space station and would obviously sharply embarrass us as we press toward achievement of the Apollo moon landing.

If the Russians do successfully fly around the moon during 1967, the uproar in Congress and across the country could nearly match the atmosphere of alarm that permeated this country in 1957 after Sputnik. Coping with such a situation would be more than difficult for a hard-pressed Lyndon Johnson.

Aerospace and the Job Corps

The public scarcely realizes to what extent the aerospace industry and allied technologically oriented firms have responded to the US government's challenge that they put their brains and organizational talent to work on the War on Poverty.

A number of urban Job Corps Centers, for example, are operated for the Office of Economic Opportunity around the country. This writer has visited some to see for himself what these little-understood places are like and how industry, in partnership with government, has fared in an enterprise so different from what rocket builders, computer manufacturers, and electronic firms have been accustomed to. Contrary to the many sensational reports that have appeared in the public print, the Centers, at least those this writer has seen, are neither hotbeds of delinquency nor the cause of community riots. Nor are



Industry has responded to the call to put its talent and organizational abilities to work in the War on Poverty. A number of firms are operating Job Corps Centers where deprived youngsters are learning trades and gaining marketable skills. This boy at the IT&T-operated Job Corps Center at Camp Kilmer, N. J., is one of thousands of Corpsmen.

they teen-age concentration camps where youngsters are marched about in sullen files.

Rather the industry-operated Job Corps Centers seem to this writer to be an experiment that slowly but surely is proving itself in the face of what must seem insuperable difficulties to the industry people and their university consultants running the facilities. The youngsters at the IT&T-operated Camp Kilmer Boys' Job Center, where this writer spent part of a week late last year, are generally descriptive of the kind of teen-agers who sign up for the Corps around the country. Whether they are Negroes or whites, rural or urban in origin, they are truly separated from the middle-class suburban mainstream of American life. Coming from broken families, in some cases from gang environments, dropouts from school, rejected by society in the large, they have had the guts to leave their "homes" and live in hardly comfortable refurbished barracks (at Kilmer, they bunk in little cinder-block buildings built in 1956 for the Hungarian refugees who were camped there) on the promise that if they stick it out they will get a chance to learn a trade and have a marketable skill. Trades ranging from auto repair and food service to office work are taught at the urban centers.

Many of them are tough looking. But it is easy to visualize them—better clothed, shorn of self-conscious mustaches and other efforts at identity seeking—as indistinguishable from teen-agers from more comfortable environments. In a future issue, after more exposure to some of these Centers, we hope to report in greater detail on where the experiment is headed.

But meanwhile industrial interest continues and an indication of that interest is this month's February

6-7 meeting at Austin, Tex., of representatives of major firms operating Job Corps Centers, the purpose of which is to exchange ideas with community leaders, educational experts, and other businessmen on all aspects of the Job Corps programs.

A partial list of the companies invited indicates the depth of involvement of American industry: AVCO, Westinghouse, Thiokol, US Industries, Burroughs, Philco-Ford, IT&T, Brunswick Corp., General Precision Equipment Inc., General Learning Corp., Xerox, RCA, Packard-Bell, Litton Industries, IBM, and Northern Natural Gas.

Space Capsules

□ The measurement of snowfall, a major contributor to the water supply, is possible through the use of satellites, studies performed for the US Weather Bureau's Office of Hydrology indicate. As little as one inch of continuous snow cover can be reliably identified from satellite photos, according to the study, which was done for the Weather Bureau by ARACON Geophysics. The basis of the study was an analysis of Tiros and Essa meteorological satellite photos which were viewed with reference to known snow-depth data for the Missouri and upper Mississippi River drainage areas.

□ Although decisions on what next after the Apollo program are still pending, NASA has awarded \$825,000 to four aerospace firms for the study of methods of exploring the planets and for the design of advanced launch vehicles. Lockheed Missiles & Space Co. has a \$200,000 contract to study manned missions in the Martian and Venusian vicinities. Boeing Co. has a \$150,000 contract for the study of

a large launch vehicle that could carry a wide range of payloads of up to 4,000,000 pounds into earth orbit, using a liquid-hydrogen/liquid-oxygen core booster with large solid-fueled or liquid-fueled strap-ons. Lockheed-California Co. has been awarded a \$250,000 contract to study an advanced launch vehicle, which would have an air-breathing, aircraft-type first stage fueled by liquid hydrogen capable of conventional horizontal takeoff and landing. A second stage fueled by liquid-hydrogen/liquid-oxygen would carry a 50,000-pound payload into orbit, while the first stage is returned to earth for reuse. North American Aviation, Inc., has a \$225,000 contract for the study of several concepts of interplanetary spacecraft for atmospheric braking to orbit around Venus and Mars.

□ The Federal Aviation Agency reports successful starting of a jet aircraft engine and operation of the engine at various power levels using gelled fuel—one of the proposed approaches of reducing fire hazards in aircraft accidents. The successful ground test, which may presage in-flight tests, was achieved at FAA's National Aviation Facilities Experimental Center at Atlantic City, N. J. Engineers indicated that although the FAA ground test with a J47 jet engine appeared promising, they would need much additional research before in-flight tests could be performed. To run the ground test, the FAA devised a makeshift arrangement to force the gelled fuel from a tank two feet wide and twelve feet long.

□ Japan, which shows promise of becoming a leading space power, will conduct a series of joint meteorological rocket launchings with the US beginning in March. The Japanese Science and Technology Agency and NASA have concluded an agreement by which ten Japanese MT-135 sounding rockets, capable of boosting 6.6-pound payloads to 200,000 feet. In addition, ten US Arca sounding rockets will be launched from NASA's Wallops Island Station in Virginia.

□ Although the US space spotlight is usually on Cape Kennedy, the Air Force's Western Test Range at Vandenberg AFB, Calif., rang up a busy 1966.

According to the Range's year-end report, the Air Force facility provided support for more than 120 major ballistic missile and spaceflights. Most splash-downs took place 5,000 miles and less than a half-hour from launch, in the Eniwetok lagoon in the Marshall Islands in the Pacific.

□ The seven US defense communications satellites that have been orbiting the earth since June 16, 1966, have survived fifty-three eclipses of the sun, according to Philco-Ford Corp.'s Space and Reentry Systems Division, the developer of the spacecraft for the Defense Communications Agency and the Air Force. The orbital paths of the spacecraft around the equator at some 21,000 miles carried the satellites through the earth's shadow before and after the last autumnal equinox because of the sun's relative position over the equator. As they passed through the dark area, the satellites were subjected to much colder temperatures, and since they rely for power on solar cells, their electronic systems stopped, cooled, and then rewarmed and restarted as the spacecraft entered the sunlight again. According to Philco-Ford, the satellites have continued to function with "virtually no communications system difficulty" since their June 16, 1966, launch, despite the extremes of temperature to which their solar cells were subjected, and their original estimated operational reliability period has now been revised upward.

□ The Air Force and the Atomic Energy Commission have successfully tested a radioisotope-powered water-recovery system which might be used aboard space vehicles in extended manned voyages. Some 500 grams of plutonium-238 were used as the direct heat source for laboratory functioning of an experimental water-recovery system that converted wash water, urine, and various condensates. The test ran for thirty days at the AEC Mound Laboratory at Miamisburg, Ohio. Researchers reported that under actual flight conditions the system could operate for as long as one year, although in the ground test it was scaled down to serve two men for a month and recovered three-quarters of a pound of water per hour.—END



Matching the curvature of the lunar horizon to a small disk, an astronaut might be able to judge distance from the moon's surface, according to Lockheed Missiles & Space Co. researchers. As the astronaut approached the surface, the horizon would appear more level, and at any point in the descent, the disk could be matched to the horizon by adjusting it to a certain distance from the eye. System might replace much costlier powered equipment.

The main trouble with US technological policy, says one of the country's leading airplane designers, the man from the "Skunk Works" who built the U-2, YF-12A, and SR-71, is that we have not started "enough advanced R&D projects in this decade." Lockheed's "Kelly" Johnson is concerned that five or ten years from now the Soviets may surpass us in military technology and science in general . . .

"Kelly" Johnson: A Worried Planner

BY EDGAR E. ULSAMER

Associate Editor, Air Force/Space Digest

THE office is spartan. The desk is functional and clean. The man behind the desk is unassuming, intense, wastes few words. What he does say is rapid and precise, yet deliberate. Clarence L. "Kelly" Johnson, Lockheed's vice president for advanced development projects, would rather build aircraft than talk to the press. But there is a quicksilver quality to him, and once he gets started on a subject he feels strongly about, or one that worries him, he takes over the discussion.

One subject that deeply concerns the builder of some of the world's most advanced aircraft—the record-breaking YF-12A, the SR-71, the U-2, and a long line of others—is the course the technological race between the United States and the Soviet Union is taking. The main trouble, he says, is that this country has not started "enough advanced R&D projects in this decade."

"Five or ten years from today the Soviets may well be ahead of us in military technology and science in general, due to their increasing output of scientists and engineers," he warns. To make matters worse, "our lead time in creating a weapon system, according to some estimates, is already thirty to 100 percent longer than that of the Soviets—and they are improving all the time."

He takes no consolation from the fact that, for the moment, the Soviets don't have the industrial depth of the United States, because "they are taking very rapid strides to rectify this fault, and in engineering and other relevant manpower they may well be on the way to surpassing us."

As for the United States's unilateral commitment to offensive missile systems, Mr. Johnson calls on this analogy: "No good carpenter would tackle his



"Kelly" Johnson, Lockheed's vice president, runs up stairs two steps at a time, saying wryly that he saves energy that way because he bends his knees only half as many times.

job with just one kind of tool in his toolbox, and there is no reason why our national defense should do so." All across the spectrum of deterrence we need "options because technological surprise is a fact of life." As an important example he cites the "alarming, high-level effort by the Soviets in the field of anti-ICBM technology," since then confirmed officially by Secretary McNamara's report of Soviet ABM deployment.

"Do they know something we don't in antimissile technology and strategy?" Kelly Johnson asks. "If they do, our deterrent force might disappear." He adds that the United States should not be satisfied with its present effort in the field of defensive systems.

Kelly Johnson, twice the recipient of the Air Force Association's Theodore von Kármán Trophy



—Wide World Photos

Clarence L. "Kelly" Johnson, accompanied by his wife, received Collier Trophy from President Johnson at White House on September 24, 1964, for designing the record-breaking A-11, later redesignated the YF-12A. AFA awarded him its Theodore von Kármán Trophy in 1964.

—in 1963 for the U-2 and in 1964 for the YF-12A —won't go into specifics because of security considerations, but in general terms he indicates apprehension over a number of policies and shortcomings.

The United States should work harder to shorten development times for new defense systems. As it stands, he says, "by the time we get systems built, they are often already obsolete." His characterization of the building-block system is that it "optimizes the component"—and does that "more on paper than in fact"—instead of optimizing the entire system.

Johnson is certain that manned air-breathing systems will be vital to the national defense arsenal of the future.

The military airplane has two things in its favor, he points out. "Air is a shield of sorts against nuclear blasts, and therefore it is probably more difficult to destroy a weapon system traveling in air than in space where a nuclear antimissile missile need not be very accurate to be effective." This phenomenon, along with the ICBM's calculable course and its in-

ability to maneuver extensively, he considers as justifying the creation and deployment of advanced manned aircraft.

Here, too, he is concerned about what the Soviets are doing.

"The worst mistake we could make would be to underestimate an opponent's resources and capabilities," he warns. In more specific terms, he refers to the MIG-21 flown to Israel in August 1966 by an Iraqi pilot seeking asylum. "It is a very good and very advanced aircraft. Yet they can afford to give it away to other nations. At home they must have something better," he says.

As for Soviet supersonic bombers, Johnson entertains no doubts that they will be developed under the guise of the TU-144, the Soviet SST, which is expected to fly in prototype form in a year or two. He is not too worried about Soviet competition on a commercial supersonic transport, saying that "the idea of designing aircraft so they are really profitable to airlines does not come easy to Communist designers." But Soviet capabilities in both engines and metallurgy, especially titanium handling, are probably good, and their ability to produce a Mach 3 bomber can't be seriously doubted, he says.

Two USAF generals have also addressed the threat from Soviet supersonic bombers. Maj. Gen. C. W. McColpin, Commander, Fourth Air Force, Air Defense Command, has said that the Soviet Union knows how to build a Mach 3 bomber which "could deliver a devastating blow while remaining several hundred miles from our coastal line—well away from the control and intercept range of present-day defense fighters."

General McColpin added that the YF-12A could be designed to incorporate a fire-control system "of greatly increased range and . . . equipped with highly maneuverable air-to-air missiles. This combination would allow the interceptor to engage high- or low-altitude targets before they could launch their destructive armaments."

And Gen. Raymond J. Reeves, Commander in Chief of NORAD, has called Soviet supersonic bombers with long-range air-to-surface missiles "a threat which we must consider a possibility for the future." He added that, if the Russians can design a supersonic transport, "there is every reason to assume

One of C. L. "Kelly" Johnson's most celebrated aircraft is the high-flying U-2. Downing of U-2 piloted by Francis Gary Powers over Soviet Union in 1960 was used by Kremlin as an excuse to wreck summit meeting in Paris. U-2s are now flying weather probes for examination of Clear Air Turbulence (CAT).





Lockheed's record-breaking YF-12A would make an effective interceptor capable of coping with future Soviet supersonic bombers, according to "Kelly" Johnson. DoD has ordered the production line to be shut down on the SR-71 version of the aircraft, and at this time no F-12s are scheduled to be built.

that they could easily adopt such a vehicle as the mainstay of their bomber fleet, which could well go beyond the limit of our present-day interceptor."

Kelly Johnson agrees. He, too, thinks that at this moment the United States does not have the right kind of interceptor to cope with Soviet supersonic bombers. The YF-12A as a fighter aircraft would be able to do the job, he says, but to date it has not been put into production. As for a completely new system, Johnson says it takes five to seven years from contract award to production of a fighter and about ten years to produce a bomber.

Johnson fully concurs with USAF Chief of Staff Gen. J. P. McConnell's statement about the "terrific military value of the SST," commenting, "It will improve the entire spectrum of our technology and shorten the lead time for any future manned system." He dramatizes this point by reaching into his desk drawer for an assortment of small SST components, explaining that the entire project down to specific components "will help us on military designs over a wide area, from wiring to structural materials for years to come."

Examining the SST in a broad sense, he predicts that the technological growth and refinement of the aircraft will be concentrated on lowering the price and reducing operating costs through the use of advanced materials technologies. Growth in the SST's range—a critical element over some international routes—will follow, Johnson predicts, but he does not expect quantum jumps through the use of new fuels and improved aerodynamics. "You could achieve great advances if all you are concerned with is supersonic flight. But since the aircraft has to be operational in other speed regimes, you need to compromise, and that's where you impose the limitations. Practical considerations make it difficult to achieve better performance through the use of such high-energy exotic fuels as propane, methane, or hydrogen," he says. "They simply need too much space because of their low density, and the only way to solve this is to eliminate the passengers—hardly a sound procedure."

Back on the subject of national defense, Kelly

Johnson calls for greater concern with two prime areas which will determine future US accomplishments in military aviation and related fields: materials and propulsion. "Materials are the pacing factor for almost everything we do," he says. At this point he takes out two bolts from his desk and hands them to his visitors to heft. They look alike but one is much lighter than the other. "The heavy one costs about \$1.50; it's made of titanium. The lighter and stronger one is beryllium and it costs over \$100. We've got a lot of work to do before we can bring the price down to where we can afford to use this material the way we should." This, he stresses, applies equally to other exotic metals.

In propulsion, the US faces a challenge that is just as critical, according to Johnson. "We have to expand our horizons when we think of engines. From the X-1 to the X-22, can you think of one experimental aircraft we have built to solve the over-all propulsion problem for high speed? The answer is none."

This is a point he dwells on, stating that the propulsion system is by far the longest lead-time item in any advanced design. He cites as an example the inlet problems of the YF-12A and the SR-71, which required a massive research effort by Lockheed and Pratt & Whitney. Difficulties of this sort will take on a new order of magnitude for hypersonic aircraft where the lifting-body design and the basic engine design become integral elements, he warns.

"In the case of nuclear propulsion," he explains, "our initial attempts have revealed that trying to get a very heavy propulsion system which requires a terrific amount of shielding to fly at a Mach number of 2.5 and high altitudes is presently far beyond the state of the art. I expect, however, that in the near future our large subsonic cargo aircraft can be designed for adaptation to nuclear propulsion. Current studies by both the Air Force and industry show that there is a great potential here."

As for hypersonic and hypervelocity vehicles, Kelly Johnson is convinced that they are technically feasible, "but we must determine exactly what we need them for before we actually build them."—END

If we recognize the space program for what it is—the spearhead of our total technological advance—we will understand better its contribution to the nation's over-all progress in a world where countries that lag technologically suffer severe economic and developmental pangs. We must think of . . .

Space as a Pacesetter for Technology

BY KARL G. HARR, JR.

THERE is one key element, perhaps most visible to [people] in the aerospace industry, which seems to have escaped the attention it deserves. [This] is the importance of our national space effort to our total technological advance.

Accomplishing what [we have] and what is programmed for . . . in the future has required the greatest organized technological reach in man's history. It is the grandest in scope and at the same time the most difficult in its separate components. Literally hundreds of thousands of people in government, industry, the universities, and elsewhere have had to join effectively in a systematized but flat-out effort to project man and machine into [a] strange and hostile environment. Virtually every scientific and technological discipline has had to be factored into this effort.

To [people] in the aerospace industry, reaching technologically under pressure is not a new experience. As a principal supplier of the nation's weapon systems [the aerospace industry has] had to be able to meet the arbitrary performance requirements and deadlines imposed by defense needs in times of both hot and cold war.

But the complexity, difficulty, and scope of the space challenge is of a whole new order of magnitude. . . .

So what? So what if we *have* effectively organized ourselves to accomplish some technological miracles?

So this. In the course of making this greatest and most difficult of technological reaches we learn more and more things. When we reach technologically for the moon and beyond, we forge new technological muscle and sinew, new technological intellect and skill. We learn new processes; we develop new materials and new ways of using them; we have to develop new technical concepts, new industrial standards, new manufacturing techniques and tolerances. Above all, we have to teach ourselves how to organize all of the components of such a technological reach, human and material, known and unknown, available and yet to be designed or discovered. As a nation, technologically speaking, we have probably never learned as much in so short a length of time as we have from our space effort to date.

In terms of total national interest the importance

of this fact is that technological advance is pretty much indivisible. [This] is true of every aspect of technological advance, including the devising of new methods of organizing it. Just how widespread can be the effect of what we learn was brought forcibly to my attention [recently] in an article in a national magazine describing how the technique of systematizing and expediting research, as developed by NASA and industry in our space program, was being used to systematize and force the pace of research looking to a cure for leukemia.

Because technological advance is largely indivisible, a nation either opts for technology or it doesn't. As some of our sister nations have learned, you either move with the tide of technological advance or you fall behind on all fronts. Senator Mike Monroney of Oklahoma described it this way, "England's current trouble has been diagnosed as a case of technology neglected. . . . Starving technology mortgages the future of [a] society. Twenty years ago, Britain picked immediate social goals over technological progress. Today, it is paying the price, lacking the production base to support either social or technical progress."

Today the question becomes the same for us. It is not: Should we as a nation have space or other things, but rather can we have the "other things" if we reject the technological reach required by space?

Again, so what? So what if the technological advances forced by the space reach do spearhead the advance of our total national technology? How much is that really worth in terms of our total national interest?

There are several answers to this question. The simplest one is that most of the important identifiable problems that lie before our nation are going to be solved primarily through organized technological reach of a high order. Such a list certainly includes controlling air and water pollution, solving the multiple problems arising from increasing urban congestion, providing adequate transportation systems for a rapidly growing population, ensuring adequate food and water supply and distribution systems, and even providing the housing and school systems which our burgeoning population will demand.

But the simple listing of specifics does not convey

the true significance to us of technological advance. The fact is that the security, well-being, and prosperity of our nation have always depended in major part on technological advance, and that dependence will increase as we move into the dangerous, crowded, fast-moving future. After all, we comprise but a tiny percentage of the world's population, and we seek not only to maintain the world's highest standard of living, but we seek to do so as free men living under free institutions. Constant technological advance is the key to achieving such national goals.

It certainly represents the best and truest hope for the poor man to improve his lot. There is merit to the ancient Chinese proverb which says, "If you give a man rice you feed his hunger, but if you teach him how to grow it you solve the problem of famine." Only through constantly advancing technology will the solutions be found in this rapidly growing nation not only to provide his minimum essentials, but also to afford him a means to participate.

Advancing technology also provides far and away the best hope for retention of our individual freedoms. Throughout history there have been those who have warned of the evils of advancing technology in terms of its encroachment upon individual freedoms. But history has always proved them wrong. Today we have much more technology than we ever had before, and we have a lot more individual freedom because of it. If there is a danger in a growing world of men becoming enslaved by technological advance, that is a much more manageable danger than the alternative; and there are examples of this both in our own depression period and today in technologically deprived nations, where, for lack of technology, man is an inevitable slave to the primitive struggle for existence.

In the great distance we have come during the few short years of the Space Age we have acquired much technological knowledge that will be applicable to our total national betterment. We have learned these things because we had to do the job. And the total technological knowledge and capacity of our nation is the better for it. As we have learned much to date we will learn much more as we continue to reach into space.

Let's look at what lies ahead. There is a range of alternatives any or all of which, in varying degrees, will involve extension of our technological reach.

Even the wholly automated program, new applications for earth-orbiting spacecraft, unmanned probes to the moon, the planets, and the void outside the ecliptic, at the lower end of our range of present possibilities, would represent a vastly greater technological challenge than those we have already met.

Moving into more difficult areas we might adopt a program involving gradually extended earth-orbital operations with manned spacecraft, building on our existing technology toward the large "permanent" space station supplied by earth-to-orbit ferry craft. Or we could gradually extend "stay-time" on the moon toward the construction of a manned lunar base.

At the far end of the spectrum, as currently envisioned, is the manned expedition to a nearby planet, most likely Mars, the celestial body least hostile to human exploration. Such a mission is deemed feasible in the decade of the '80s, probably about fifteen

years after the initial lunar landing. Of course we do not have the technology today for such a venture; but we can confidently calculate that we can build such capability within that time span.

If we do all or most of these things, which incidentally would require approximately the same percentage of our gross national product as is now being allocated to space, we shall continue to force the whole pace of American technological advance far into the future. As it has in the past, such advance will set the pace for our total national technological advance. Every aspect of our national life which is influenced in any degree by technological advance will be the beneficiary.

My point is this: Leaving aside the advantages in scientific knowledge, national prestige, defense insurance, domestic economics, and everything else, the task of conquering space requires far and away the greatest technological reach man is faced with, and perhaps ever has been faced with. On a thousand interrelated fronts it sets the pace for all technological advance. Whether you call it forced technology, responsive technology, stretched technology, or whatever, it will be this particular technological focus of our efforts that will lead the way of our whole national technological advance. . . .

If we recognize our space effort for what it truly is, i.e., [the] pacesetter of our total technological advance, and if we believe that the nation's future well-being depends in many vital ways upon such advance, then I submit we can all begin thinking more clearly about the true relationship between the nation's continuing commitment to space and our total national interest.

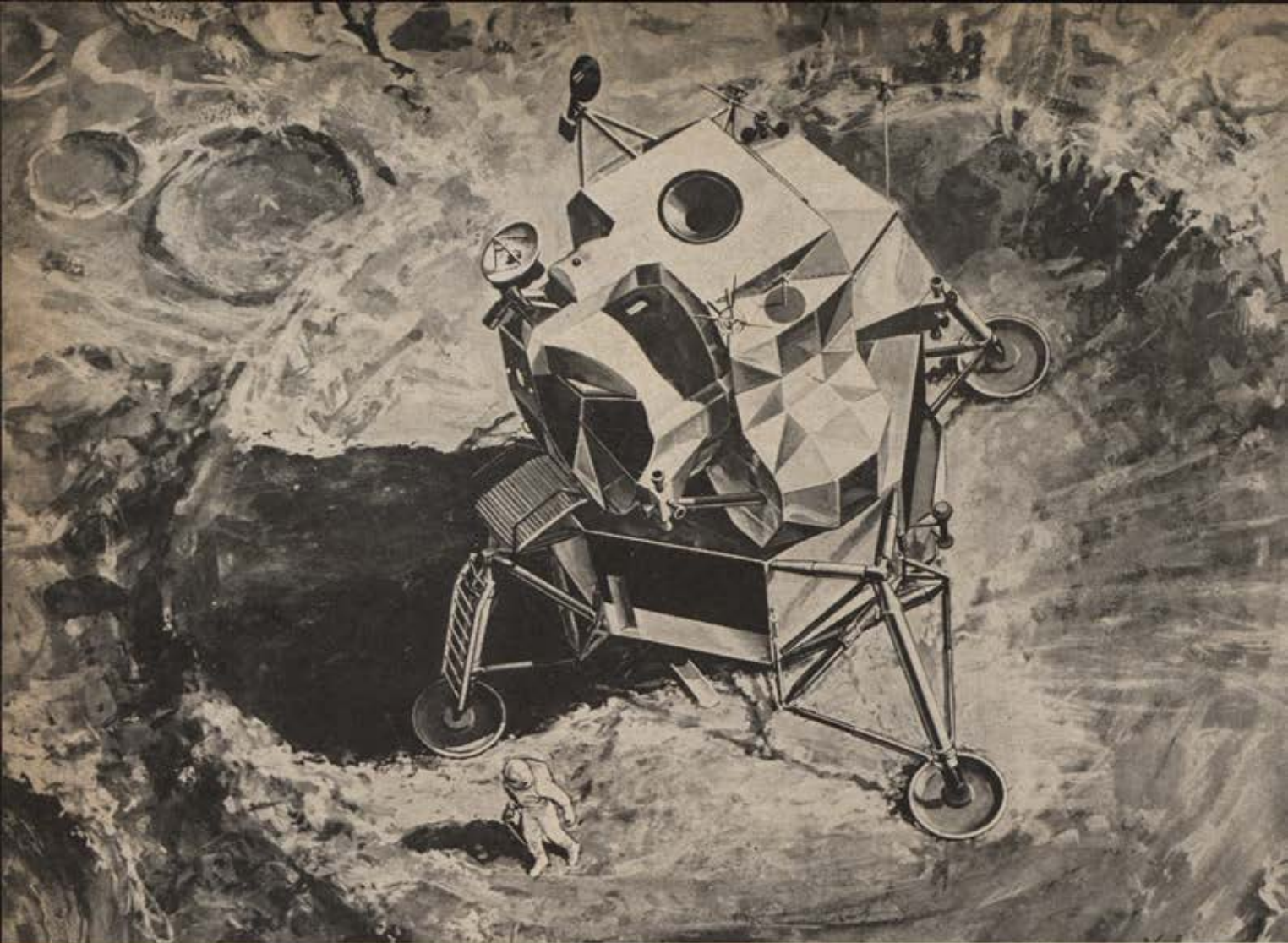
But there is one other key point to bear in mind as we [recall the recent] twenty-fifth anniversary of . . . Pearl Harbor. If we learned any lesson from December 7, 1941—and the space "Pearl Harbor" represented by the launching of Sputnik—it should be this: Not only must a nation make a fundamental decision that it will opt for technology, and not only must it recognize the relationship between technological advance in one area and total technological advance, but it also must learn of the indivisibility of technological advance in terms of continuity and succession.

The scrambling we had to do after Pearl Harbor to mobilize technologically for war, and the scrambling we had to do after Sputnik to mobilize technologically for space exploration should have brought home to all of us the essentiality of continuously pressing for such advance. . . .

The aerospace industry [has] had to learn about long lead times and how to deal with them. Hopefully the nation as a whole has learned that insofar as defense and space matters are concerned, we can afford no technological gap.—END



Mr. Harr is President of the Aerospace Industries Association, a former Defense Department official, and a onetime Rhodes Scholar. The above article is excerpted from a recent speech by Mr. Harr at Town Hall, Los Angeles, Calif., delivered December 6, 1966.



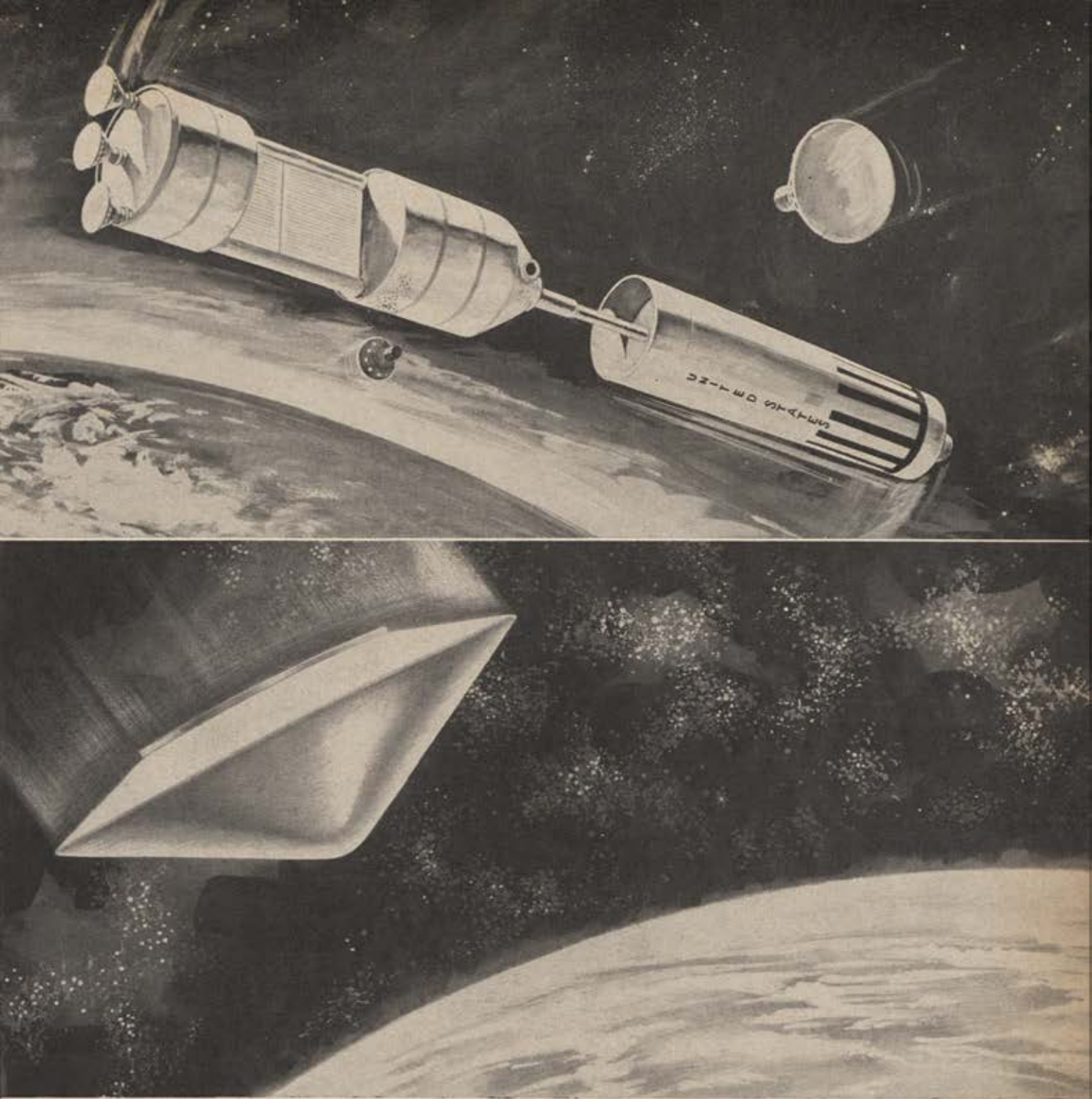
Grumman's across-the-board Space Capabilities 1967-1977

PRESENT LM WORK

Construction of all vehicles scheduled for 1967 delivery is well under way. We have already delivered the first Lunar Module to Kennedy Space Center. This year we deliver to NASA the vehicle scheduled to land on the moon. We are confident of meeting the goal of landing a man on the moon safely before 1970.

ADVANCED SPACE MISSIONS

Grumman has spent over three years studying the application of our Apollo/LM vehicles to a variety of earth orbital, lunar orbital and lunar surface missions. Also, their relevance to scientific earth resources, communications and logistics missions. We've expanded the scope and intensity of studies in planetary probes, advanced scientific satellites, military applications, lunar bases, re-entry vehicles and manned Mars missions.



MARS MISSIONS

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Nuclear power, usually thought of in military terms, is coming into its own as an inexpensive, clean, and abundant source of energy for civilian uses. And its potential is being demonstrated at the very time that power requirement forecasts for a burgeoning population around the world indicate the fantastic amount of energy that will be needed in the decades to come . . .

Nuclear Power: Clean and Abundant Energy for a Space-Age World

BY DR. GLENN T. SEABORG

Chairman of the Atomic Energy Commission

IN TODAY'S technologically oriented civilization we have become very conscious of our energy needs and resources. And this energy consciousness, this awareness that the wise management of expendable energy is a major factor in our current and future development, comes to us none too soon. A few statistics and projections point this out quite dramatically. Our current population in the United States is approaching 200,000,000. It is conservatively estimated that by the end of the century—only thirty-three years away—we will have over 350,000,000 people in the US. While this is not quite a doubling of our population, a projection of our energy needs during the same period indicates we may expect a more than threefold increase in energy consumption. . . .

I think we can be grateful that, historically speaking, nuclear energy arrived on the scene when it did. The nucleus of the atom offers great promise as a major source of electric power and that promise is rapidly being filled today. Before discussing the growth of nuclear power, and the policy associated with its growth, let me point out some of the features which make that growth desirable.

With reference to . . . air pollution, nuclear powerplants offer decided advantages over fossil-fueled plants. The main advantage stems from their control of waste. In a nuclear reactor the split atoms, or "fission products" as they are called, remain within the fuel cladding until such time as the reactor is refueled. Then the used fuel elements are removed, stored under water for a cooling-off period, after which they are safely shipped to a reprocessing plant where unused fuel and valuable radioisotopes are extracted for future use. The remaining waste products are then safely disposed of in storage tanks at underground burial sites. The extremely minute amount of radioactivity produced auxiliary to the operations can be held and released in such tiny amounts, and under such favorable atmospheric conditions, that it poses no health hazard whatsoever. Or it can be packaged for safe disposal in other ways. In fact, a nuclear plant can be built without any stack at all.

In contrast to this, the stacks of fossil-fueled plants must release to the atmosphere effluents which contain amounts of carbon dioxide, which cannot be

reduced, and sulphur dioxide, for which no effective removal system has yet been developed.

In addition to the direct reduction of the rate of air pollution by the use of nuclear plants, if nuclear-generated electricity could be used as the basis for a predominantly electric-powered transportation system—that is, electric rapid-transit conveyances and battery-powered automobiles—a substantial reduction in air pollution could be effected.

Nuclear power is relatively independent of geography because of the extreme compactness and long life of nuclear fuels, and, therefore, nuclear plants can be operated far from their sources of raw fuel material—uranium and thorium ores—without significant economic penalty.

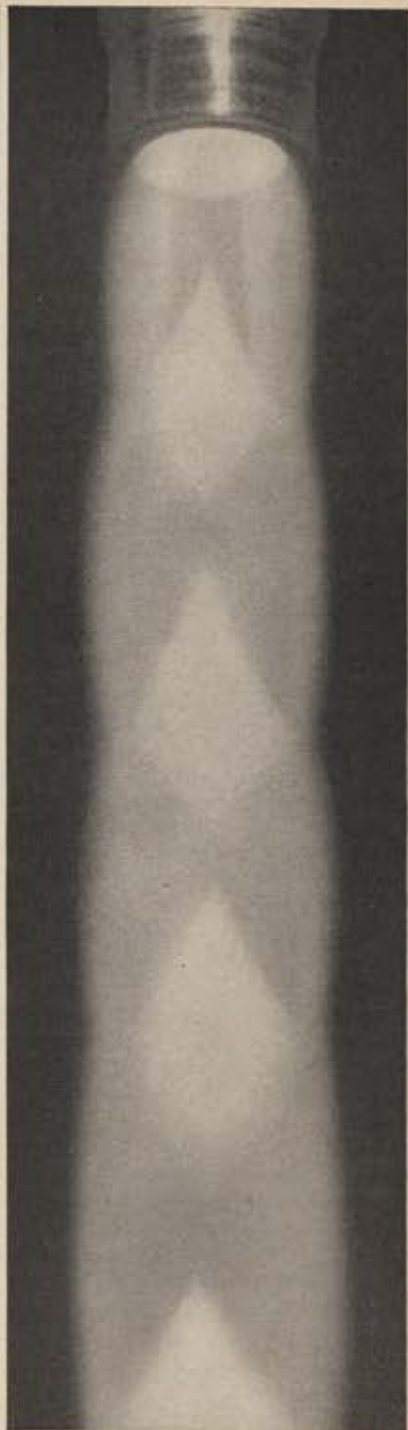
Finally, nuclear energy lends itself well to use in large nuclear power stations generating large blocks of very economical power. The current realization of this economic factor is the primary cause for the growth of nuclear power today and will influence the major role it will play in the future.

What have been the developments in the history and policy of nuclear power which have led to its current status? What is that current status? And where does nuclear power go from here? . . .

While the assets in the development and production capability of the wartime Manhattan Engineer District were transferred to the civilian Atomic Energy Commission in 1946, the principal occupation of the Commission for a number of years continued to be related to military defense purposes. Of course, the dream of peaceful uses of nuclear energy flourished with the first realization of the technical feasibility of the nuclear-fission chain reaction as early as 1942.

While some civilian nuclear energy development projects . . . were initiated prior to the passage of the Atomic Energy Act in 1954, it was not until that legislation permitted broader declassification and broader participation by industry that serious efforts really led to major expansion. Since that time the transition from government monopoly to industrial cooperation and completely privately owned plants has proceeded quickly and, in my opinion, very successfully.

The initial thrust of civilian nuclear power has



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been in the development of plants using light, water-cooled reactors. An important contributor to the development of these reactors has been the AEC's naval-reactor program. The pioneering of light water reactors—today the mainstay of the nuclear industry—was performed in the development of the nuclear-powered submarine. A further key development was the construction of the first large nuclear electric powerplant, using a pressurized water reactor, which began operating in 1957 at Shippingport, Pa.

Within more recent years a broad range of technologies for civilian nuclear-power production has been developed. Projects have included the design, construction, and operation of experimental and prototype reactors. The operating experience of prototype reactors on utility systems has been important to our over-all nuclear-power development. Likewise, the maximum assumption of financial responsibility by industry has been, and continues to be, a valid element of providing incentives for the achievement of economically competitive nuclear power. Through this process the industry has now reached a point where large capacity nuclear powerplants employing proven light water reactors are being built, and it appears they will prove to be economically attractive in comparison with fossil-fueled plants in many sections of the country, including some areas where inexpensive fossil fuels are readily available.

As civilian nuclear power grows, it quite naturally will be assuming greater responsibilities in fulfilling our over-all energy requirements. And, as this happens, private industry's role in nuclear power will grow at an increasing rate. The Commission has been proceeding for a number of years on a course intended to permit the nuclear-power industry to flourish with minimum government involvement.

One recent step taken in minimizing governmental involvement with private industry was the passage and implementation of legislation regarding private ownership of special nuclear materials. This legislation now permits, and by the early 1970s will require, private companies to own the nuclear fuel in their power stations. Previously it was required that this material be owned by the government and leased for commercial use.

Another important phase of industry's participation in nuclear power was initiated in 1966—the operation of the first privately owned nuclear fuel reprocessing plant. As things stand now, the sole remaining operating function for which private nuclear power is dependent upon the government is the enrichment of uranium conducted in our government-owned gaseous diffusion plants. And we have reached the point where the future possibility of private industry's becoming involved in this function is now coming under serious study.

Nuclear power is beginning to pay some returns for the investment of approximately \$1.5 billion of tax money which has been spent on its development. Based on projected nuclear-power growth rates and reductions in cost of power production, the returns will show the investment well justified. However, nuclear power also has certain additional developments which must be pursued if it is to play a major role

in supplying our country's and the world's future expanding power requirements.

What are some of the current developments in nuclear power? In what direction is the AEC moving to try to assure that nuclear power fulfills its promises of abundant and economic power? . . .

We believe that, with the excellent cooperation we have had from the country's nuclear industries and electric utilities, we have successfully carried out our commitments to [our] first two objectives—leading to the demonstration of economically competitive nuclear power and helping to establish a self-sufficient nuclear-power industry.

Our country now has in operation and committed for operation the light water reactors which should help demonstrate that nuclear power can safely, efficiently, and economically generate civilian electric power.

It is appropriate that the government now concentrate on the next objective. Consequently, there is a shifting of interest and efforts toward developing reactors which will be best suited to "stretch out" the low-cost reserves of nuclear fuel, and eventually to utilize the high-cost nuclear fuel, through a more efficient utilization of fuel. Of course, no new system—no matter what its importance to the over-all fuel economy—will be widely adopted if in itself it is not economic. Cost, therefore, remains an important factor in our reactor development thinking.

With all this in mind, our major efforts now are being directed toward the third specific objective stated in our 1962 report—the development of reactor types known as "advanced converters" and "breeders."

To understand what these reactors can mean in terms of the future development of nuclear energy it is necessary to know some basic facts of nuclear technology. . . .

When today's light water reactors, fueled with uranium, are operated at their economic optimum, they use only a very small fraction of the latent fission energy contained in their uranium. That is the case because they are using essentially the fissionable isotope uranium-235, of which there is only a very small fraction in their uranium fuel. Should we continue to use only these types of reactors, it would not be long (in view of projected power demands) before even the large supply of economic nuclear fuel resources known in the world today would be exhausted.

However, it is possible to convert uranium-238 and the other abundant nuclear source, thorium-232 (both of which we refer to as "fertile" materials), to fissionable fuels. This important conversion can be accomplished by transmuting, within reactors, uranium-238 to plutonium-239, and thorium-232 to uranium-233. Plutonium-239 and uranium-233 are fissionable and can be used as reactor fuel. The net effect is to "burn" indirectly the nonfissionable, very abundant, fertile uranium-238 and thorium-232.

Most reactors accomplish this extremely productive transmutation to varying degrees and do so during the course of producing power, but water-cooled reactors do so only to a small extent. (Incidentally, of the new fuel produced, some is "burned" in place and some is later extracted and reprocessed for fu-

ture use.) Those improved converter reactor systems which produce almost as much new fuel as they consume we refer to as "advanced converters" or "near breeders."

It is also possible to develop—and work has already begun on them—reactors that through the conversion process produce *more* fissionable material than they consume while generating electricity. Here again the net effect is to "burn" indirectly, but in this case almost completely, the nonfissionable uranium-238 and thorium-232. These reactors are called "breeders." The significance of the breeder reactor to the future of nuclear power lies in the fact that it is the key to unlocking the tremendous energy stores in the nonfissionable but extremely abundant isotopes uranium-238 and thorium-232. By allowing us to make the most efficient use of our nuclear resources this new technology gives us promise of a vast supply of economic power.

The known worldwide reserves of uranium and thorium are vast, and new reserves of these ores will no doubt be discovered. But it is only through breeder reactors that a large fraction of the energy in these natural resources can be utilized and that an adequate source of energy can be assured for centuries to come. . . .

If high-gain breeder reactors are available by [1990]—and I think they will be—then the amount of uranium available at \$30 per pound or less is sufficient to operate more than 50,000,000 megawatts of nuclear power for the thirty-year lifetime of the reactors. Most importantly, the use of high-gain breeder reactors will permit economic utilization of uranium costing far more than \$30 per pound, which is available in vast quantities, and this will provide a virtually unlimited source of energy. And the use of thorium with efficient breeder reactors gives rise to a potential source of nuclear fuel sufficient to accommodate an additional nuclear electric capacity comparable to that which will utilize uranium. . . .

In the past two years, sales of nuclear powerplants have shown remarkable growth. Sales of nuclear plants, which amounted to a combined generating capacity of 2,000,000 kilowatts in 1963-64, rose to over 5,000,000 kilowatts in 1965, and in [December] nuclear plant sales [were] approaching 20,000,000 kilowatts.

Today, as a result of the current light water reactors being sold, competitive nuclear power is bringing down the cost of electricity in this country. The development of large nuclear reactors and new associated technologies is also making feasible the construction of the large dual-purpose nuclear plant for producing electricity and desalting seawater.

Such a plant, the first of its type, is currently being planned to serve the Los Angeles area. . . . The savings being passed on to the consumer by competitive nuclear power are paying him back for his investment as a taxpayer in developing nuclear technology. This process should continue as new and more economical nuclear plants are built. In the future the procedure may go one step further in bringing us benefits not even hoped for when nuclear power was first introduced. I refer here to the possibility that a

very economic and efficient breeder reactor economy could bring the cost of electricity down to a level where abundant, very cheap power would have a major influence on our entire economy.

It is conceivable that the future will see vast, automated industrial complexes built around large nuclear powerplants. These nuclear plants, in the multimillion-kilowatt range, would be producing electricity and process heat so cheaply that they could be used to separate and recycle enormous quantities of waste of all kinds, reprocessing it together with new raw materials into feed materials to be fed to manufacturing plants in the same complex. They could desalt seawater and recycle sewage to give us fresh water for drinking and for agriculture. They could extract minerals from the same seawater. They could supply the electricity to produce steel by hydrogen reduction, make large quantities of nitrogen and phosphate for much-needed fertilizer, and provide the heat, electricity, and radiation to process new ceramics, metals, polymers, and many new substances. Furthermore, such a nuclear-powered industrial complex would be quiet, clean, and compact. Underground arteries, conveyor belts, and pipelines might replace the maze of roads and rails usually associated with such operations. Few if any chimneys would rise from this complex in which all potential pollutants would be carefully controlled. . . .

I have concentrated . . . mainly on a discussion of nuclear power through nuclear fission. There are two other sources of energy on which I would like to touch briefly. They are sources which are directly related. I am speaking of solar energy and controlled thermonuclear fusion. The fusion of nuclei of hydrogen, of course, produces the energy of the sun which supports all life on earth so that, in a sense, this source of energy is not new to us.

Many advances are being made today in the direct harnessing of solar energy, and this form of energy has proved useful in our space program. It is conceivable that increased use will be made of this abundant and low-cost energy source with the development of even more efficient and less expensive solar cells. While solar energy will never be a source of large blocks of power because of the low intensity of sunlight here on earth, it may prove useful in many areas where the energy demands are moderate.

The development of controlled fusion would provide mankind with a virtually limitless supply of energy, as it would mean we could use as a fuel the heavy hydrogen found in common seawater. It has been estimated that the energy from the heavy hydrogen nuclei in the oceans is equivalent to the energy of 500 Pacific Oceans filled with high-grade fuel oil. Such a potential fuel resource cannot be ignored.—END



Dr. Seaborg is the Chairman of the Atomic Energy Commission and a distinguished scientist who has been honored with the award of the Nobel Prize. The above article is excerpted from an address to the National Conference on Air Pollution, Washington, D. C., December 13, 1966.

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To further his own political ambitions, Canada's Minister of Defense Paul Hellyer has speeded up the unification of Canadian armed forces and made unnecessary changes which are detrimental to military morale and national defense policy, as well as being foreign to good management principles, contends this author, an experienced Canadian military planner. But to his credit, Mr. Hellyer has created a parliamentary committee to investigate the problem, which, hopefully, will slow the tempo and force some compromises . . .

Canada's Military Unification— Greater Efficiency or Chaos?

By Air Vice Marshal Robert A. Cameron, RCAF (Ret.)

WE'RE breaking new ground. There is no blueprint for this action. We can't go to anyone and say, 'How did you do it? What were your mistakes? What is the best way to tackle this or that problem?' We have to make all these judgments on our own. We will carefully consider every step and move as our intellect directs us, but we won't be panicked by any imaginary time clocks."

This statement was attributed early in 1965 to Canada's Minister of Defense, Paul Hellyer. It refers to his widely publicized program for the unification of Canada's armed forces into a single military service. But despite his good intentions, the wholesale firing and replacement of top brass, plus last summer's so-called "Admirals' Revolt," leave little doubt that at some point Mr. Hellyer began to ignore his intellect and in fact became panicked by a time schedule.

The Progress of Unification

From the launching of the unification program with the appearance of his "White Paper on Defense" in the spring of 1964, until late in '65, Mr. Hellyer seemed to be making suitable headway with his plans.



The author, retired Air Vice Marshal Robert A. Cameron, spent thirty-five years in the RCAF. More than eight of those years were in Washington, where his job involved technical liaison with the aerospace industry. For another eight years he was assigned in Eastern and Western Europe. Much of his career was in the management and organization areas. Before retiring in 1966, he was RCAF Director of Organization and Management.

The three service headquarters were reshuffled into a single integrated staff. This was Stage I.

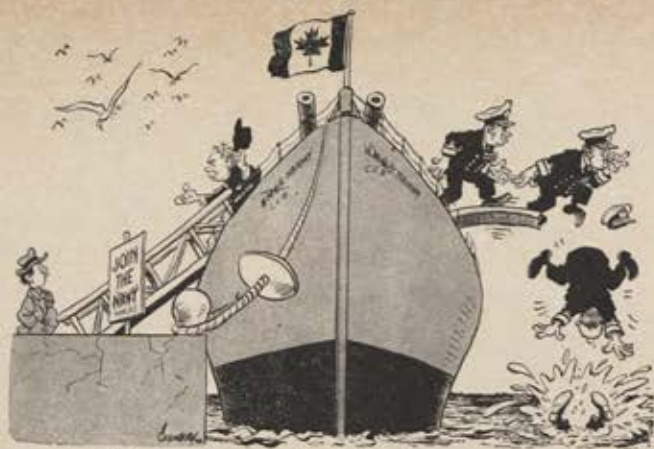
A functional command system was established to control all field units, and the complicated process of setting up these subordinate Headquarters, plus the reassignment of units, was well in hand (See "Canadian Aerospace: A Tightened Belt and A Clear Eye," by Norman Avery, Feb. '66 AF/SD). End of Stage II.

After some initial alarm at the sweeping nature of the integration proposal, a few beheadings, and several voluntary retirements, people were slowly getting used to the idea. By the fall of 1964 the principal appointments both at Defense Headquarters and in the field were filled with top-quality officers who presumably had the respect of their service colleagues. The prevailing mood of military personnel varied from a wait-and-see attitude to mild optimism, depending on whom you talked to.

Then in the spring of '66, and with Stages I and II under his belt, the Minister suddenly speeded things up. Stage III, the final process of unification, involved some hard-core problems, including a deep cut at service traditions. Top advisers were counseling a go-slow policy and were talking about five years as a reasonable time to complete the job. But the word from the front office was "full speed ahead."

Explosion in the Top Rank

At that point there seems to have been an abrupt parting of the ways between the civilian and military authorities. Result: a purge of top brass such as Canada had never before experienced was set in motion. At Defense Headquarters the top five appointments (amounting in US terms to the Chairman of the Joint Chiefs plus all four Service Chiefs) either left their



"You've come at the right time, my boy—
a few vacancies have just opened up."

—Reprinted by courtesy of *The Mail-Star*, Halifax, Nova Scotia

jobs in complete frustration or were sent to the showers by the Minister during an incredible eight-week period.

This wholesale replacement of senior officers got only scant coverage in the press. But in mid-July Rear Adm. William Landymore, head of the unified Maritime Forces and a redoubtable champion both of service efficiency and naval traditions, blew his stack! He did this at a press conference, and the results were electrifying.

Admiral Landymore was promptly fired and all other admirals resigned in protest at the Minister's program. Support for the Admiral's stand against complete submergence of service identity appeared across the country as well as from members of the other services. Within days, the myth of "great enthusiasm" for unification had been blown sky high. Nevertheless, final score for the summer in favor of the Minister—thirteen of fifteen major appointments changed hands with nine of the incumbents either being fired or taking early retirement.

Will Mr. Hellyer be able to pull Canada's severely shaken apparatus of defense together and achieve both the economy and efficiency that were the stated purposes of unification? Many doubt that he will. One erstwhile enthusiast puts it this way: "He had a good thing, and he had it made. But he forgot people. There wasn't nearly as much wrong with the services as Hellyer made out, though with better integration we stood to improve them. In pushing too quickly for complete unification, he has muffed his chances and has dealt Canada a serious blow in the eyes of its allies, to boot."

Mr. Hellyer's Goals

Mr. Hellyer's boast was better defense than before at a total cost of \$1.5 billion per year plus small annual increments for inflation. However, an initial cut of 500 aircrews from the Air Force escalated to a drain on talent that cost him a whacking 150-percent increase in risk pay before he stopped the rush to civil airlines. Similarly, an over-all rundown that was to cut the numbers in uniform from 125,000 to 110,000 is now sliding below the 105,000 mark with no outpouring of new recruits to reverse the trend. (Ironically, one of

the first moves Mr. Hellyer made was to unify the separate recruiting systems and cut numbers by a third!) This inability to stabilize the force size is brushed off as competition from the civilian economy. But to counter the problem, the country is faced with costs of \$100 million a year in increased pay. Part of this would have been inevitable without unification, but part of it certainly represents a buying back of attraction for military life that Mr. Hellyer threw away when he unified the services.

Another goal was to raise the portion of the defense budget spent on capital equipment from the twelve percent, to which it had dropped, up to twenty-five percent. It's not anywhere near this yet, and if it ever does reach this figure within the current budget, most experts think it will only be achieved with a force goal of about 75,000-80,000. In the face of these figures many people wonder whether Canada has either the right defense policy or the right Minister of Defense.

Three Aspects of Canadian Defense

In appraising the Canadian defense picture at this time, three principal aspects attract attention. The first, of course, is the unification process. Then there is Mr. Hellyer's political ambition, which amounts to a serious conflict of interest. It isn't a normal case of equity in a commercial company, but it's every bit as prejudicial to good defense. And, finally, there is the nation's new defense policy, which on analysis seems similar to, and just as retrograde as, General de Gaulle's nationalistic orientation for France.

The Canadian Department of Defense had faced some serious problems during the previous Conservative administration, but these didn't produce the chaos Mr. Hellyer claimed to have found when he took office. There were problems to be sure, and frustrations, but definitely no chaos. Apart from the necessity to complete some important nuclear agreements, it was a financial squeeze that promised the biggest headache for the new Minister. There was no doubt that military overhead was increasing at a faster rate than the taxpayer's willingness to absorb it.

After several months' deliberation, Mr. Hellyer decided that unification of the services was the only way to resolve the financial dilemma. In selling this revolutionary program to cabinet colleagues, he promised greater economy and efficiency, and he took exception to three principal things in the old system: the number of senior officers with direct access to him, wasteful competition between the services, and duplication of effort.

It is indeed hard to understand the Minister's reluctance to consult with a panel of four senior officers, all of whom could speak from vast personal experience. His responsibilities include three highly specialized military activities that have about as much in common as do Pan Am, US Steamship Lines, and the International Harvester Co., however much he may persuade himself to the contrary. The corporate management of any group like this in civil life would certainly include top specialists from each of the components. But Mr. Hellyer has elected to make

(Continued on page 80)

1961



1962



1963



1964



1965



1966



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A one-over-one arrangement like this makes no sense whatsoever. This is not simply a personal or "military mind" judgment. Every management expert in the country would regard it as highly undesirable even if both incumbents were geniuses. Since we breed few geniuses in Canada, there will usually be an enormous gap in their understanding of a problem. Instead of bridging this chasm with a modern management team, we have linked the civilian and military sides of defense with what amounts to a single tight-rope—an arrangement that is guaranteed to make the Minister's already difficult job even more so.

The Minister might argue that in practice most of his decisions will be taken in consultation with some officers at the deputy level, as well as with the CDS. And so they may. But the deputies are staff specialists only; in no sense can they be regarded as experts in the three disciplines of the military trade. The way the Headquarters has been designed, practically everyone down to the rank of colonel should be homogenized, and it is on officers of this rank the Minister will have to depend for his specialist advice. This will force him, as one civilian critic puts it, "down into the nuts and bolts of defense where he has no business to be."

Wasteful Competition?

One hears a lot about the damage "wasteful competition among the services" did to the country and how unification will avoid it. Another version of the accusation is that the services, each with its own little empire, pushed strategy and reequipment plans in isolation from the over-all defense policy. Specific instances to support this contention are lacking for the simple reason that they never existed. True, certain service programs have been undertaken that subsequently ate up a bigger slice of the defense pie than was originally anticipated. This had the effect of putting more money on some programs than desired and so in a sense distorting policy. But the difficulty was the result of poor budgetary procedures; it could have been (and may well be) encountered even in a unified organization.

Happily the US recently developed a technique to avoid this pitfall, and it has been adopted by Canada. As it is working out in the US, the Program Package Budgeting System seems to control sectional initiatives and pressures without destroying their great merit in advancing the state of the military art.

Without competition to stimulate our civilian economy, we would not be living as well as we are. Without some healthy competition in defense to keep us ahead of the threat, many of us might not be living at all!

Two Kinds of Duplication

One could write at length about duplication of effort among the three services. Inevitably there is some. But there are two kinds. There is wasteful

duplication and there is productive duplication. In an early brush with unification, I worked in a building with three stamp-vending machines. This was judged to be wasteful duplication so two were eliminated. The remaining one was locked up each day at 4:15 p.m. Since much of my mail was generated after that hour, my staff had to resort to greater use of the more expensive telecommunications to get action!

No one will resent Mr. Hellyer for wanting to cut wasteful duplication. But many fear that the cure he proposes will be worse than the disease. As James Forrestal, the man who was later to become first US Secretary of Defense, said during World War II to a congressional committee: "Unification appears to offer the goal of less duplication and great economy. But in practice it is more likely to result in a monstrous bureaucracy that consumes more than it saves, by increased overhead and lost opportunities."

To appease his apprehensive military flock, Mr. Hellyer has often stated there will continue to be units and personnel specializing in combat on land, at sea, and in the air. He has said, in effect, that in his program of unification there is no need to reach down too far. But despite these assurances, the Defense Minister now seems to be doing just that. The Navy has been particularly outspoken against encroachment on its traditions and way of life—encroachment that seems prompted more by political appeal than demonstrable gains in economy and efficiency. This more than anything else is considered to have caused the explosion last summer.

What Had Already Been Done

Before Mr. Hellyer took up the idea of unification as his own, much had been done to avoid duplication in Canadian defense. The Chaplain, Legal, Dental, and Medical Services, plus our three officer training schools, had been completely integrated. The Army provided rations for all three services; we had a National Defense Communications System embodying all static military communications; we had an integrated Maritime Headquarters, for tactical operations in Canada.

Early on, Mr. Hellyer integrated the recruiting, public relations, ground transportation, and intelligence services. The Navy took responsibility for the Air Force's maritime requirements, and the Air Force was made executive agent for the provision of navy and army aircraft as well as its own. The Pay Corps of the three services are in the process of being amalgamated as are the Works Services and Supply as it concerns common-user items. Most people agree that unification of these functions can be accomplished without incurring too great a bill for cross-training or suffering a loss of efficiency as a result of reduced specialization.

But so long as people fight on land, at sea, and in the air, they will have to be supported by certain supply, technical, and operational facilities where interchangeability of personnel will be completely impractical. And so long as people have to fight and



Many say Canada's Minister of Defense Paul Hellyer has modeled himself on his US counterpart, Secretary of Defense Robert S. McNamara. Mr. Hellyer would deny that he set out to be a Canadian McNamara, but there are many similarities in their methods. At left, Mr. Hellyer, right, chats with Mr. McNamara at meeting at NATO Headquarters.

die, identity with others who share the same way of life will be vital.

The Minister speaks about ironing out anomalies in terms of service, trade structure (300 down to about 100), opportunities for promotion, commissioning-from-the-ranks policy, retirement ages, and the like. But critics note that "these things can be done by ministerial edict and don't require the complete suppression of service identity—the soldier to give up his kilts or the sailor to do away with his pipes and the time-honored "Aye, Aye, Sir!"

It is the Minister's seeming passion for homogenization that has resulted in the creation of the Tri-Services Identity Organization (TRIO). It sprang up overnight and at last reading had nineteen branches across Canada. This group is not against unification as such; it simply wants to ensure that what is done will in fact make for a better system. It is against change for the sake of change or change for the sake of Mr. Hellyer's political career. For the unhappy truth is that the Minister's political ambition is known to be very much at the root of his passion for unification and his senseless rush to complete it.

Mr. Hellyer's Ambitions

The year 1967 has two important implications for Mr. Hellyer. In the first place it is Canada's centennial year, in the course of which there will be military parades in all parts of the country. It would naturally be a considerable feather in the Minister's hat if the participants who swing smartly down the nation's avenues are dressed in a common, perhaps even "hellyertrope," uniform, and if this achievement is drawn to the attention of the public with suitable attribution. Not that Mr. Hellyer has need of such recognition to hold his job. But all along he has recognized the necessity of some sort of a spectacular achievement for promotion out of the defense post, and a part of his

zeal for unification is certainly with this in mind.

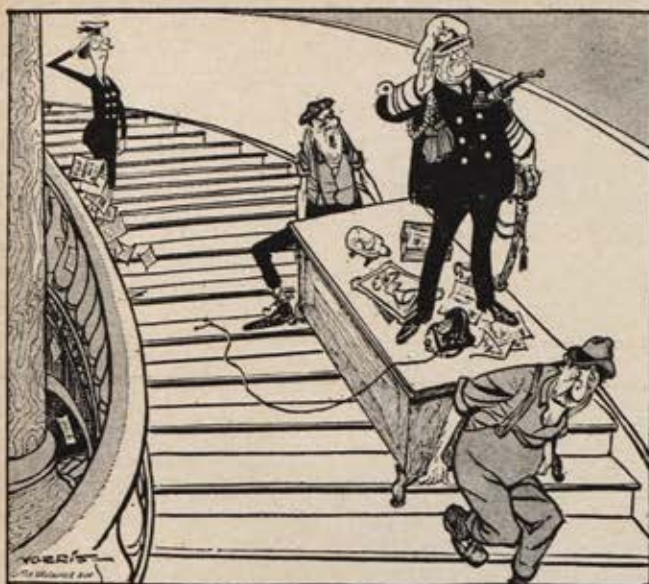
The second reason why there is a magic about 1967 for Mr. Hellyer is the Liberal convention scheduled for this year. Occasionally before, but more frequently last summer, he has been talked about as a possible leader of his party. If he is over the hump of integration with a good press, and is available for reassignment when convention time rolls around, it would clearly be a high card in his bid for the top job. Hence another reason for bucking the go-slow advice of his staff and driving both himself and his program to a make-or-break point in their futures.

A discussion of Mr. Hellyer's political ambitions wouldn't be complete without mentioning the influence that US Defense Secretary Robert McNamara has had on him. Mr. Hellyer would deny that he set out to be a Canadian McNamara when he became Minister or that McNamara urged him, as has been suggested, to "press on with unification so we can see if it works." But there can be little doubt that in opting to revolutionize Canada's military organization, Mr. Hellyer took moral courage from the strong-arm methods of his colleague in the US. Mr. McNamara, of course, hasn't done away with his military advisers; he just ignores them. And therein lies a world of difference.

When Mr. McNamara moves on or out, he will at least leave an adequate management team to serve his successor. But when Mr. Hellyer goes, Canada will be saddled with a future reorganization to correct his mistakes—unless, of course, he does something about them in the meantime.

Complete Switch in Defense Policy

The most far-reaching aspect of Mr. Hellyer's revolution may turn out to be not his unification of the forces, but his complete switch in Canadian defense
(Continued on following page)



"I don't mind them having their little traditions . . . but this is the fourth fired admiral this week who's decided to go down with his desk."

—Reprinted courtesy of *The Vancouver Sun*, Vancouver, British Columbia

policy. Because of the emotion being stirred up over unification, this other aspect is not getting the attention it should from either the public or the Canadian Parliament.

Since the Korean War buildup, Canada's defense policy has been one of "interdependence." Canada integrated a powerful 300-plane force with the French and the US on the Central Army Front in Europe, a mechanized army brigade group with two British ones in Northern Army Group, while the Maritime Air Command and Navy assumed extensive antisubmarine responsibilities under SACLANT. During the 1950s

we built a respectable air defense force that in due course was integrated with elements of the US services in NORAD. And finally, as well as reserves for augmenting our Brigade Group in Europe to a division, we maintained forces for sundry tasks in Canada plus peace-keeping missions assigned by the UN.

Then along came Mr. Hellyer with his new look of 1964. In appraising Canadian defense policy, he decided there was none. He let it be known that the previous government had saddled us with a lot of "expensive junk," and that the sooner we were rid of it, the better. In crystal-balling our needs for the future, here is the wording of his vision:

"This new philosophy is one of emphasis and changing roles. It does not preclude the fulfillment of those obligations previously undertaken and the utilization of the equipment purchased at staggering costs by the former government for those tasks. It does mean a shifting emphasis and a greatly increased capacity in an area where a Canadian contribution is a real addition."

The dynamite in this statement is, of course, in the last sentence. When you hunt up specifics, you find that this "shifting emphasis" and "greatly increased capacity" mean that our force structure in the future will be built around four army brigade groups from which Mr. Hellyer hopes to draw "hard-hitting units for service anywhere in the world in response to UN and other peace-keeping requirements."

The Move Toward Nationalism

Thus far, substantial additions have been announced to our sea and airlift capability, and more are contemplated to make our army units completely mobile. An order has been placed for cross-support aircraft.

(Continued on page 85)

Backbone of the Canadian Air Transport Command is the Lockheed Hercules. At right, troops board a Hercules transport during an exercise in the province of Alberta.

Air Transport Command operates twenty-four Hercules transports for the Canadian armed forces.



Rapid Transit... Vietnam style



The long road north from Saigon is dotted with travel-folder names — Phan rang, Binh-dinh, Quang-tri, Thanh-hoa — all complete with leeches, mud, and booby traps. Inevitably, the Allied footsoldiers will cover every miserable step of the way. One of the few comforting sights on this weary journey is the

constant nearness of search, rescue and evacuation helicopters. The trip back for our sick and wounded is as quick and comfortable as we can make it . . . and will stay that way. Kaman Aircraft Corp., Bloomfield, Conn., suppliers of Search and Rescue Helicopters to the Armed Forces.

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In place of the ambitious Avro Arrow interceptor, whose cancellation was a severe blow to the Canadian aerospace industry, Canadian air defense units now are equipped with the McDonnell F-101 Voodoo.

When operative, they will be "able to exercise with the land elements they are required to support." In addition a wide range of new equipment is on order for the army. When all these programs are complete, it is easy to see there won't be much left for "fulfilling those obligations presently undertaken."

It seems clear that Mr. Hellyer has in store for Canada nothing more or less than what General de Gaulle has done for France. Jointly with our allies in NATO, we criticize the General for his excessive nationalism. Yet here is Mr. Hellyer steering us away from the entirely modern concept of interdependence and back to the idea of a unified national force—a concept that surely went out of fashion for Canada with the War of 1812!

Canadian Contributions to NORAD

The future of Canada's contribution to NORAD will be of particular interest to the reader. It's no secret that Mr. Hellyer never has had much sympathy for NORAD. He considers the F-101B and the Bomarc missile as some of the "expensive junk" referred to earlier. He feels there is little US interest in NORAD because so far every Commander in Chief has retired from the post at the end of his tour rather than going on to other assignments. And Mr. Hellyer's thinking about future hardware for air defense is no more logical. It is contained in this illuminating quote from his White Paper on Defense: "Some of these aircraft [the close support F-5s he is buying for his mobile army units] would also contribute to air defense as required, thereby eliminating the necessity for acquiring special aircraft for this purpose." It sounds almost like a unilateral Canadian version of the "Open Skies Policy"!

Canada's once-powerful contribution to 4th ATAF in Europe is being allowed to wither on the vine. By contrast with the trouble Mr. McNamara gets into every time the question of reducing American forces in Europe hits the fan, it amuses me to note the ease

with which Mr. Hellyer has gone about the problem. He has never liked the F-104, so cutting numbers and squadrons is one of the real pleasures in his business, and no one argues with him. As a sop to SACEUR, Mr. Hellyer will no doubt offer tactical air support for the mobile army units he will keep available for deployment to Europe. Who besides Mr. Hellyer would equate tactical air support with conventionally armed F-5s for even the whole of Canada's four brigade groups, with the 144 atomic-capable Starfighters we once had, which SACEUR claims he still needs?

Mr. Hellyer has frequently acknowledged that the foreign and defense policies of a country must go hand in hand to be successful. But many Canadians are asking under what circumstances these mobile units are going to be used. To read the propaganda, one would think we are prepared to go off alone and fight for the peace of the world in any hot spot that needs attention. We may well undertake some *observer* missions alone, if we don't price ourselves out of the market. But one thing every Canadian knows is that our troops won't be *fighting* anywhere unless they are fighting alongside allies. And in these circumstances, what amounts to self-contained mobile police units will be a shabby contribution from a nation with Canada's industrial capacity.

It's common to accuse the military of always being prepared for the war before the one that ultimately confronts them. Well, in Canada's case, it may be just the opposite. Mr. Hellyer seems to ignore present realities and to be outfitting us for those halcyon days several wars in the future when nightsticks may well settle the conflict of nations!

The Effect on Airpower

A final comment on this new force structure has to do with its effect on Canadian airpower. Airpower is a bad word for many people who can't understand it, and this, by all indications, includes Mr. Hellyer. (Continued on following page)

Nevertheless, it does exist. And a cardinal principal, since airpower became a recognized factor in military strategy, has been to avoid dividing it up into penny packets. However, when Mr. Hellyer's new look becomes fully effective, Canada's air forces will be split in three distinct parts: a tactical element dominated by Army thinking for the support of mobile battalions, a maritime element dominated by Navy concepts, and an air transport element.

In these circumstances, there will be little prospect of cross-fertilization and no staff element will exist at the top to foster the over-all development of airpower in conformity with its ever-widening horizons in the world at large. This is not a complaint about the functional command system. It simply harks back to the lack of high-level specialist input at defense headquarters—our former Service Chiefs, or what with our unified management would correspond to the big business device of Product Line Managers.

What's Happened to Civilian Control?

In summing up this sorry picture it is hard to escape the conclusion that Mr. Hellyer has so far done little for economy and efficiency in defense and has made a travesty of one of democracy's cherished ideas, *i.e.*, civilian control of defense.

In 1963 Canada had a defense system of which she could well be proud. By periodic adjustments to organization and strategic outlook, as well as to equipment and training, we were keeping abreast of competition throughout the world. Our forces, wherever they served, were respected for their professional competence and *élan*.

Then along came Mr. Hellyer. He was young (thirty-nine) and knew relatively little about defense (his own admission). But he claimed that this made for great objectivity and was just what defense needed

from its top man. Within a few months he decided on a complete reorganization of the Canadian force structure and a totally new defense policy. He set about this revolution while the government had the slimmest of working majorities and, consequently, no guarantee of his continuing in office during the time it might take to accomplish such a monumental task. He did away with the three top service advisers and thus deprived himself and the country of the one important safeguard against unrestrained enthusiasm in this important post. And finally, to compound chaos, he ruthlessly purged his opposition and stepped up the integration simply because it suited his political ambitions!

Running Too Fast and Too Far

So far as I know there never has been, nor is there now, any question of an alternative to political control of the defense organization. But surely with our resources in imagination we can come up with some way to make a good thing better without tearing it apart to begin with. Meanwhile, despite an alerted press and public and parliamentary opposition, it is unlikely that the government will be overthrown. And without this, Mr. Hellyer will end up doing pretty much what he wants. On the other hand, some compromise is now clearly on the books, for he can't afford another blood-letting such as he had last summer.

Canada has no experienced watchdog committee organization, as has the US, to protect our defense department from abuses of this sort. But to his credit, Mr. Hellyer has created a parliamentary committee that is now starting to function with moderate effect. And in running too fast and too far with integration, the Minister may have given this group a stepping-stone to real power that will ultimately impose sensible restraints both on himself and on future Ministers of Defense. At least we hope so.—END



When and if Mr. Hellyer's plan becomes fully effective, Canada's airpower will be divided into three distinct parts: a tactical element dominated by Army thinking, a maritime element dominated by Navy concepts, and an air transport element. The latter is represented by the C-130 Hercules at left. In these circumstances, the author contends, there will be no staff element at the top to foster the over-all development of airpower.



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News and Comment about Air Force People...

By Jackson V. Rambeau

AFA DIRECTOR OF
MILITARY RELATIONS

Needed: An End to Bickering

WASHINGTON, D. C., JANUARY 10

Once again, the Secretary of Defense has gone out of his way to irritate a congressional committee—over a bill that is certain to pass in the House and has been assured a hearing in the Senate.

The subject this time is the Reserve Forces Bill of Rights. It was written last year by Rep. F. Edward Hébert (D.-La.), a subcommittee chairman of the House Armed Services Committee, after an earlier facedown with Secretary McNamara over whether Congress or the Defense Department had jurisdiction in determining the structure of the Reserve Forces. Secretary McNamara, you will recall, had set into motion machinery to merge the Army Reserve into the Army National Guard. The House Armed Services Committee opposed the plan and forced the Secretary to back off.

Mr. Hébert then drew up his Reserve Bill of Rights, to establish in law both a Reserve and National Guard, and setting forth details on their structure and administration. When he called for hearings on his bill, DoD opposed most of its features. Nevertheless, the bill passed the House with only one dissenting vote. It died, however, when the Senate failed to act before adjournment last October.

Since that time, Sen. Richard Russell (D.-Ga.), Chairman of the Senate Armed Services Committee, has promised to consider the bill after House repassage.

With congressional approval of the bill thus virtually assured, a group of military leaders from the Pentagon visited Mr. Hébert in Louisiana in December to discuss DoD's objections. Mr. Hébert indicated he would be willing to consider modifications and wrote Secretary McNamara inviting DoD's comments on changes. Back came a two-sentence reply signed by Mr. McNamara's deputy, Cyrus Vance. Thank you for your letter, it said in effect. But there's no need for further comment, for our views on the



Though performing urgent airlift missions, like this New Jersey ANG C-121 delivering priority cargo to SAC base on Guam, four Air Guard C-97 and C-121 groups and eight AF Reserve C-119 units are marked for elimination this year, reversing DoD decision to retain some another year.

bill are the same as those we expressed before your subcommittee last year.

The letter achieved two immediate effects. It reddened the faces of the DoD emissaries who thought they had been empowered to discuss revisions with Mr. Hébert. And it prompted Mr. Hébert to cancel plans for subcommittee hearings and promise that his Bill of Rights would pass the House before the end of January.

Secretary McNamara exhibited the same stubbornness last year on the military pay raise. Even when it was obvious that Congress would grant both a civilian and military pay boost, Mr. McNamara refused to budge.

We might add that there is again no provision in DoD's FY 1968 budget for a cost-of-living raise, even though Congress is almost certain to approve a raise for government employees, including the military.

A task force under Rear Adm. Lester E. Hubbell, USN, has been hard at work for more than a year developing guidelines for widespread reform of military compensation and benefits. But because of steeply rising costs of the war in Vietnam, DoD has decided to shelve the Hubbell recommendations for this year. This means that, instead of gaining the benefit of the Hubbell group's exhaustive studies, any military pay and benefits legislation this year will be drafted on the Hill without Pentagon assistance.

Still a third issue on which Mr. McNamara was overriden last year was on retention of three Air Guard transport groups which DoD had scheduled for elimination last September 30. In the FY 1967 appropriations bill, Congress voted funds for their retention. DoD is now going ahead with plans to deactivate those three ANG groups during FY 1968, plus one more and eight AF Reserve C-119 units as well. Once again it's up to Congress to override the Secretary of Defense, who still refuses to agree that the nation needs all the airlift it can get, at

Maj. Wayne N. Whatley is awarded Air Force Cross by AFLC Commander Gen. K. B. Hobson at Kelly AFB, Tex., for guiding rescue craft to his downed wingman, despite heavy ground fire which crippled Whatley's F-105 over North Vietnam.





Sen. John G. Tower (R-Tex.), only member of Congress now serving in Enlisted Reserve, is sworn in for new four-year hitch as Boatswain's Mate 3d Class by Cmdr. Allen L. Peek, USNR. Senator Tower, member of Armed Services Committee, served on gunboat in western Pacific in WW II.

least as long as the war continues in Vietnam. We certainly hope Congress will do so.

Confronted with all these examples, the average serviceman might well wonder who is looking out for his interests. Certainly it is not DoD, which should be his spokesman. Instead he must rely on Congress to remedy DoD's omissions.

An improvement in relations between DoD and Congress is long overdue. In preparing its legislation, Congress needs the advice and cooperation of DoD. Continued conflict between the two cannot possibly be in the best interests of the country.

Overcoming the Pilot Non-Shortage

As recently as late last fall, Secretary McNamara was insisting there was no shortage of pilots in the armed forces. But in December he authorized the Army to boost its training rate to 610 pilots per month, a fifty-percent increase. To provide facilities for the Army's advanced helicopter training, he deferred the closing of Hunter AFB, Ga., which had been scheduled for June. The base will be turned over to the Army at that time.

Less than three weeks later, DoD announced the expansion in Air Force pilot training which we mentioned in "Parting Shots" last month. It includes 487 more spaces for the Air Force and forty-nine for foreign pilots. Also, as we mentioned, Randolph AFB will return to the pilot-training business, as soon as some other activities can be transferred. (Maybe USAF will seize the opportunity to move the Military Personnel Center back to the Washington area.)

These actions have not been sufficient to dissuade Sen. John Stennis (D-Miss.) of the Senate Armed Services Committee from investigating the reasons underlying the pilot shortage. AFA, which has been looking into all facets of the problem (see December 1966 "Bulletin Board"), was invited to submit its findings informally to Senator Stennis' subcommittee.

The Air Force isn't waiting until Randolph is ready and more trainer planes are acquired to expand its pilot production rate. It enrolled an additional fifty-eight students in classes beginning in December at its eight existing training bases, and will continue to add extra candidates each month. To do so, training squadrons are going to a six-day schedule with instructors and maintenance personnel carrying a heavier workload.

Actually, the reentry of Randolph into pilot training may well represent a second increment in boosting the training rate. The increase granted by DoD is barely half of the 900 additional pilots USAF needs annually. It hopes to get authority for the remainder in the FY 1968 budget.

A passing note: There are 1,300 pilots in the Air Reserve and Guard transport groups DoD has marked for inactivation in the next year. If the units are eliminated, some pilots may shift to other units; few junior officers will enter on active duty under USAF's modest recall program. The pilot skills of the majority will be lost to the armed forces.

Medical Scholarships—But No Dental Care

Another budget casualty in meeting costs of the Vietnam War is DoD's plan to seek dental care for military dependents, at least for this year. It was to have been high on DoD's priority legislation list, but the \$150 million price tag for the first year's operation dictated its withdrawal. However, Sen. Robert F. Kennedy (D-N. Y.) was expected to introduce a dental care bill early in this session which closely matches DoD's original plan.

DoD is going ahead, though, in requesting a small-scale program to provide scholarships for prospective medical officers, with a view toward eventual elimination of the doctors' draft. Scholarship expenditures can readily be justified because they would call for four years' service



DoD refusal to grant proficiency pay to Air Force mechanics, though allowing it to Army aviation maintenance personnel, is contributing to all-time low reenlistment rate not only among first-term airmen but in eight-year group as well. AFA is on record urging wider pro pay benefits.

after graduation. The retention rate among doctors now being drafted for two years is extremely low.

DoD is planning to start with a thousand scholarships in the next fiscal year. But since the first results are years away and it would take an estimated 13,000 scholarships to replace the doctors' draft, DoD will urge Congress to extend the latter which comes up for renewal this year.

AFA's Medical Council has long favored the scholarship approach.

AFA to Set Up Junior Officers' Council

Establishment of a Junior Officers' Council in the Air Force Association to consider and recommend solutions to major service problems of Air Force junior officers has been proposed by AFA President Jess Larson.

"For some time, the Air Force Association has maintained a keen interest in the area of career motivation for young officers," Mr. Larson said in a letter to commanders
(Continued on following page)

of seven major USAF commands inviting nominees for the Council. "This interest has been heightened this past year by the requirement to retain more officers because of the situation in Southeast Asia."

"At the same time, we are aware of many factors in the civilian economy attracting an increasing number of promising young officers out of the service. We are anxious to help in solving this problem."

Commanders of ADC, AFSC, CAC, HedCom, MAC, SAC, and TAC were each invited to nominate one lieutenant or captain to serve on the Council. AFA hopes to schedule its first meeting prior to, or in connection with, the National Convention in San Francisco, March 14-17.

Parting Shots—Dr. W. Randolph Lovelace, II, who was AFA's Chairman of the Board when he died following a lightplane crash in Colorado in December 1965, was posthumously awarded the Kitty Hawk Award of the Los Angeles Chamber of Commerce for distinguished civilian achievement. . . . Maj. Gen. Reginald C. Harmon, USAF

Dr. Chiao Jen Wang, veteran aerospace research expert, heads new Office of Advanced Engineering in DoD's Advanced Research Projects Agency. He earned Ph.D. at Johns Hopkins University in 1953.



(Ret.), first Judge Advocate of the Air Force, serving from 1947 until his retirement in 1960, was recently named Director of the Air Force Aid Society. . . . USAF will award scholarships to 3,000 cadets in its four-year AF-ROTC program this year, reports Brig. Gen. Donald F. Blake, AFROTC Commandant.

Time-in-service requirement for promotion of USAF first lieutenants to captain has been cut to three and a half years. By April, USAF will promote 11,300 first lieutenants, including 6,000 previously selected at Hq. USAF.

In a photo in last month's column, we incorrectly identified Col. Stanley V. Rush as CAC's 4th Reserve Region Commander. Colonel Rush heads the 512th Military Airlift Wing at Carswell AFB, Tex., under the 4th Region, whose commander is Col. John T. Shields.

SENIOR STAFF CHANGES . . . B/G Thomas H. Beeson, from Vice Cmdr., Hq. 14th AF, ADC, Gunter AFB, Ala., to C/S, Allied AF, Southern Europe, Naples, Italy, replacing M/G Lloyd P. Hopwood . . . B/G Russell A. Berg, from Dep. Dir., MOL Program, OSAF, and Dep. Cmdr., MOL, AFSC, Los Angeles, Calif., to Dir., Office of Space Systems, OSAF, replacing M/G James T. Stewart.

M/G John B. Bestie, from Dep. Dir., National Military Command System, to Dep. Dir., NMCS Technical Support, DCA, with additional duty as Dep. Dir., DCA, Washington, D. C. . . . B/G Archie M. Burke, from Cmdr.,



Maj. Gen. Don O. Darrow, left, is relinquishing command of Ninth AF, Shaw AFB, S. C., to take over TAC's Nineteenth (Suitease) AF at Seymour Johnson AFB, N. C. Maj. Gen. Harold E. Humfeld, right, new Director of Maintenance Engineering at Hq. USAF, formerly commanded SAC's 1st Strategic Aerospace Div. at Vandenberg AFB, Calif.

37th Air Div., ADC, Goose AB, Labrador, to Vice Cmdr., 14th AF, ADC, Gunter AFB, Ala., replacing B/G Thomas H. Beeson . . . B/G Harmon E. Burns, from Dir. of Maintenance Engineering, DCS/S&L, Hq. USAF, to DCS/M, 7th AF, PACAF, Saigon, Vietnam, replacing B/G James H. Thompson.

Milton A. Chaffee, from Dep. Dir., Command & Control, Office, Deputy for Limited War, ASD, AFSC, Eglin AFB, Fla., to Technical Adviser (Tactical Planning), ESD, AFSC, Hanscom Field, Mass. . . . M/G Don O. Darrow, from Cmdr., 9th AF, TAC, Shaw AFB, S. C., to Cmdr., 19th AF, TAC, Seymour Johnson AFB, N. C., replacing M/G Luther H. Richmond . . . Dr. Lawrence J. Edwards, from Research Chemical Engineer, to Chief Scientist, Rocket Propulsion Lab., AFSC, Edwards AFB, Calif.

M/G Philip H. Greasley, from C/S, ATC, Randolph AFB, Tex., to DCS/Plans & Policy, J-5, NORAD & CON-AD, Ent AFB, Colo. . . . Dr. George K. Hess, Jr., from Chief Scientist, National Range Div., AFSC, Patrick AFB, Fla., to Deputy for Engineering, ASAF (R&D), Office Sec. AF . . . M/G Harold E. Humfeld, from Cmdr., 1st Strategic Aerospace Div., SAC, Vandenberg AFB, Calif., to Dir. of Maintenance Engineering, DCS/S&L, Hq. USAF, replacing B/G Harmon E. Burns.

B/G John M. McNabb, from DCS/Tech. Training, to C/S, ATC, Randolph AFB, Tex., replacing M/G Philip H. Greasley . . . M/G John C. Meyer, from Dep. Dir., Joint Staff, to Vice Dir., Joint Staff, JCS, Washington, D. C. . . . Wesley G. Pace, from Supervisory Program Analyst, to Special Asst. for Materiel Programming, DCS/S&L, Hq. USAF . . . M/G Luther H. Richmond, from Cmdr., 19th AF, TAC, Seymour Johnson AFB, N. C., to Cmdr., 9th AF, Shaw AFB, S. C., replacing M/G Don O. Darrow.

Karl Scheller, from Research Aerospace Engineer, to Senior Scientist (Physical Chemistry), Aerospace Research Labs., OAR, Wright-Patterson AFB, Ohio . . . M/G William T. Smith, from C/S, DCA, to Asst. Dep. Dir., DCS/Program Implementation, DCA, Washington, D. C. . . . M/G James T. Stewart, from Dir., Office of Space Systems, OSAF, to Dir. of Space, AFRDC, Hq. USAF . . . B/G James H. Thompson, from DCS/M, 7th AF, PACAF, Saigon, Vietnam, to Asst. to CinC, SAC, with duty station 5th Bomb Wing, Travis AFB, Calif.

RETIRED . . . Gen. Hunter Harris, Jr.; B/G Benjamin A. Strickland, Jr.—END

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PUBLISHED FOR THE LEADERS OF THE FREE WORLD BY THE UNITED STATES AIR FORCE ASSOCIATION

1750 Pennsylvania Ave., N.W.

Washington, D. C. 20006, U.S.A.

NEW YORK • CHICAGO • DENVER • LOS ANGELES
SAN FRANCISCO • LONDON • PARIS • MUNICH

CHAPTER OF THE MONTH

Amarillo, Tex., Chapter cited for effective programming which has focused widespread community attention on the Air Force Association mission.

The revitalized Amarillo, Tex., Chapter's recent Twentieth Anniversary Membership Banquet concluded the day-long activities of Airman Appreciation Day at Amarillo AFB.

More than 20,000 persons were on hand at the base to see a performance of the Air Force's famous Thunderbirds precision flying team. Other activities included a parade, a performance by a drill team, and static displays for public inspection.

Featured guests at the banquet, which was attended by more than 200 and was held in the Galaxy Room of the Bank of the Southwest, were Congressman-elect Bob Price, Amarillo Mayor F. V. Wallace, the Thunderbirds, and SMSgt. Jose M. Galdiano, who received an AFA plaque designating him as the "Airman of the Year" for the Amarillo Technical Training Center.

During the banquet program, Congressman-elect Price and State Representative Hudson Moyer were presented AFA memberships. In his remarks, Mr. Price stated that he would appeal the scheduled closing of Amarillo AFB.

Col. Robert N. Wilkinson, USAF (Ret.), was chairman of the program and, according to Chapter President Joe Mason, was instrumental in breathing new life into the Chapter.

The recent observance of the sixty-third anniversary of the first flight by the Wright brothers at Kill Devil Hills, N. C., was sponsored by AFA in cooperation with The First Flight Society (formerly the Kill Devil Hills Memorial Society), the National Aero-

nautic Association, and the National Park Service.

Ceremonies at the First Flight Site were presided over by David Stick, a member of The First Flight Society's National Advisory Board, and included a welcome from Kill Devil Hills Mayor Thomas Briggs and brief remarks from Charles S. Marshall, Assistant Director, Southeastern Region, National Park Service; Arvin Basnight, Associate Administrator of Programs, Federal Aviation Agency; and Maj. Gen. Rollen H. Anthis, Commander, Headquarters Command, Bolling AFB, Washington, D. C.

Musical selections were presented by the Elizabeth City High School Band under the direction of Scott Calloway and an aerial tribute was flown by F-102 Delta Daggers of the 169th Fighter Group, South Carolina Air National Guard. Among the memorial wreaths laid at the First Flight Monument was one from AFA's Wright-Memorial Chapter of Dayton, Ohio.

Following the ceremonies at the site, a Memorial Luncheon was held at the John Yancey Motor Hotel with S. Wade Marr, president of The First Flight Society, serving as Toastmaster. After remarks by Ralph V. Whitener, secretary of The First Flight Society's National Advisory Board, AFA's President Jess Larson delivered an inspiring address.

One of the highlights of the luncheon program was the unveiling of portraits of Wilbur and Orville Wright by the donor of the portraits, John Yancey, president of the John Yancey Realty Co. and owner of the John

Yancey Motor Hotel. The portraits are the beginning of a Hall of Fame for "Aviation Firsts."

A unique feature of the observance was the attendance of ninety-four members of a newly organized travel club from Dayton, Ohio, who made the inaugural flight in the club's DC-7—"The Kitty Hawk One"—to Kill Devil Hills to attend the Memorial Luncheon.

Among the many dignitaries attending were George D. Hardy, Chairman of AFA's Board of Directors; Maj. Gen. Brooke Allen, USAF (Ret.), Executive Director of the National Aeronautic Association; Maj. Gen. Don O. Darrow, Commander, Ninth AF, Shaw AFB, S. C.; Maj. Gen. Luther H. Richmond, Commander, Nineteenth AF, Seymour Johnson AFB, N. C.; Maj. Gen. Ben Fridge (AFRes), who is a former Assistant Secretary of the Air Force (Manpower, Personnel, Reserve Forces); Rear Adm. Jesse Johnson, USN (Ret.), newly elected president of The First Flight Society; and Col. John Jennison, Director of Information, Headquarters Command, Bolling AFB, Washington, D. C.

At the Utah State AFA Organization's annual convention, held recently at the Ramada Inn in Ogden, delegates elected David Whitesides to succeed Tucker Simpson as State President. Other officers elected were: Nolan Manfull, First Vice President; Harvey Bergen, Second Vice President; Fred Hannah, Third Vice President; Doris Edvalson, Secretary; Robert Wixom, Treasurer; and Keith Nichols, Judge Advocate.

Certificates of Appreciation for service to the State Organization were presented to sixteen of the State's members during a noon election luncheon. Those went to: Bertie Evans, Malcolm Birch, Carl F. Fernelius, Clinton Campbell, Robert MacArthur, Doerr Peterson, Paul Simmons, Dee Stoddard, Fred Hannah, Raymond Cassell, Harvey Bergen, Harold Page, Doris Edvalson, Don Edvalson, Dean Wallwork, and Frank Perry.

The Utah AFA President's Trophy, a rotating award, was presented at the evening Awards Banquet to the Ute Chapter as the State's outstanding



First Flight Anniversary ceremony participants included, from left, Maj. Gen. Rollen Anthis, AFA President Jess Larson, and Arvin Basnight, FAA.



Utah AFA President-elect David Whitesides, left, presents the President's Trophy to Ute Chapter President Jack Price, center, and Utah's "AFA Man of the Year" award to Nolan Manfull.

Chapter of 1966. The Ogden Chapter received the Outstanding Achievement Award plaque for 1966 for conducting the annual Weber Valley Air Fair.

Nolan Manfull received the State AFA's award designating him its "Man of the Year" for 1966. Wayne Gamble received its Exceptional Service Award plaque.

Maj. Gen. T. Alan Bennett, Ogden Air Materiel Area Commander, received a Certificate of Appreciation and a watch in recognition of his outstanding support of the State Organization during 1966. Col. John Christiansen, Director of Supply and Transportation, accepted for General Bennett.

Also cited were Bob Bowman, Pub-

lic Relations Award; Barrett Pulham, Award of Merit; the Beta Sigma Phi Sorority, Certificate of Appreciation for its help to the Organization during the two "Howdy Pardner Day" programs; and members of the news media and several aerospace companies who were recognized for their outstanding support of the State Organization and its objectives.

AFA President Jess Larson was the principal speaker at the banquet held during the Ohio AFA's recent State Conference in Dayton.

During the banquet, Russell Kuehl, Wright-Memorial Chapter President, received the award designating him the Ohio AFA's "Man of the Year" for 1966. Also honored were Maj. Gen.

John L. Zoeckler, Deputy for the F-111 program at Aeronautical Systems Division, who received the State AFA's Airpower Award; and Lt. Col. Ralph J. Maglione, Commander of the Air Force's Thunderbirds.

An added attraction at the banquet was a special report on the US space program by the Air University Aerospace Presentation Team. While in Dayton, the members of the team—Lt. Col. James Wall, Maj. Robert K. Potter, and Maj. Dannie R. Hoskins—made similar presentations at several of the city's high schools.

At the Conference's business session, George Gardner of Dayton was elected State President, succeeding Charles Whitaker of Akron. Other State officers elected are: Loren Dietz, Vice President; Bernhard Osborne, Secretary; and Kenneth Banks, Treasurer.

The Annual Meeting and election of officers of AFA's Iowa State Organization was held at Simpson College, Indianola.

The meeting followed a banquet cosponsored by the Iowa State AFA and the Simpson College Aerospace Institute. John F. Loosbrock, Editor of AIR FORCE/SPACE DIGEST, was the principal speaker.

(Continued on following page)



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During the meeting, incumbent state officers, President Robert Collins, Vice President Allen E. Towne, and Secretary-Treasurer William Sampson, were reelected. The following were also elected: Donald Koontz, Director of Education; C. Max Miller, Director of Membership; and Richard Jorgensen, Director of Programs.

The New Mexico State AFA Organization recently held its annual business meeting and election of officers at the Cannon AFB Officers' Club.

Delegates elected Maj. Gen. Sam W. Agee, USAF (Ret.), to succeed Loyd Franklin as State President; and C. A. Copple and Walter Haut to be Vice President and Secretary-Treasurer respectively.

The program included an illustrated presentation on the F-111 tactical fighter by Col. Dale S. Sweat, Commander, 832d Air Division at Cannon AFB.

Among the dignitaries attending were retired Air Force Gens. J. E. Briggs, H. L. Sanders, and Dan Hooks.

Meeting in Milwaukee, Wis., delegates to the Wisconsin AFA's Annual Convention elected Fred R. Munte to succeed Joseph J. Lingle as its President. Mr. Munte was then installed by James H. Straubel, AFA's Executive Director.

More than 160 attended the Con-

AFA Executive Director James Straubel, left, installed and congratulated Wisconsin Chapter presidents, from left, Lyle Ganz, Bruce Fish, and Gerald Hayes.



vention Dinner-Dance that followed the business session. During the program, National Director Lee Cordell presented to Chapter President Bruce Fish the charter for AFA's newly organized Madison Chapter, and Mr. Straubel installed the newly elected Presidents of the State's three Chapters (see photo).

State President Lingle presented four Wisconsin AFA awards to three men and one organization for their contributions to aerospace development.

Paul H. Poberezny, president of the Experimental Aircraft Association, received the Aerospace Educational Achievement Award; Lee Berndt, Executive Secretary of the Metropolitan Jaycees, accepted the Aerospace Community Service Award in behalf of his organization; Capt. James R. Arnold (AFRes) received the Meritorious Service Award; and Col. Leonard Dereszynski (AFRes), a Past President of the State AFA Organization, received the Aerospace Public Relations Award. (Colonel Dereszynski received an additional honor the follow-

ing day when, at its Pearl Harbor Day Dinner, the Milwaukee Eagles Club presented him its highest award—the Richard I. Bong Memorial Award—for his activities in the military reserve and for his community service.)

Principal speaker of the evening was Col. Jack Reiter, Office of Legislative liaison, USAF.

The following morning, Glenn Mishler, Great Lakes Regional Vice President conducted a regional meeting.

AFA's Virginia State Organization held its Tenth Annual State Convention in conjunction with the Langley Chapter's annual salute to the TAC Commander and his staff.

During the convention business session, held at the Holiday Inn in Hampton, incumbents John Pope, State President, and Leonard Woody, Secretary-Treasurer, were reelected. Other officers elected are: A. A. West and Richard Emrich, Vice Presidents; and Cliff Dougherty, Judge Advocate.

Walter Barrick, AFA's Central East Regional Vice President, gave a report on current and future activities within the Region. Capt. Glenn Bethany of Hq. TAC at Langley AFB gave an excellent briefing on TAC.

More than 200 attended the evening reception and dinner-dance saluting the TAC Commander and his staff. This event, held in the Langley AFB Officers' Club, is sponsored annually by the Langley Chapter and is one of the most outstanding events held in the State.

During the dinner portion of the program, Gen. G. P. Disosway, TAC Commander, and AFA President Jess Larson each made a short address. Highlight of the evening was the presentation of a \$500 check to Mrs. Disosway by Langley Chapter President Ben Favre on behalf of the Chapter; the money is to be placed in the base welfare fund.

—DON STEELE

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Objectives

• The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights to all mankind.

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Active Members: US citizens who support the aims and objectives of the Air Force Association, and who are not on active duty with any branch of the United States armed forces—\$7 per year.

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State Contacts

Following each state contact's name and address are the names of the localities in which AFA Chapters are located. Information regarding these Chapters, or any phase of AFA's activities within the state, may be obtained from the state contact.

ALABAMA: A. T. Ousley, 715 Cleermont Drive, S. E., Huntsville, phone 539-3222. **BIRMINGHAM, HUNTSVILLE, MOBILE, MONTGOMERY, SELMA.**

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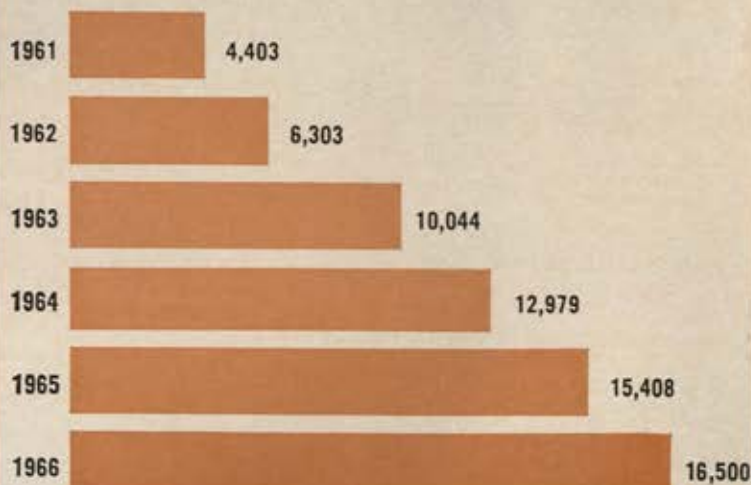
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☐ I enclose \$7 for annual AFA membership dues (includes subscription (\$6) to AIR FORCE/SPACE DIGEST).

☐ I am an AFA member.

I understand the conditions governing AFA's Group Life Insurance Plan. I certify that I am eligible for this insurance under the category indicated, that I am currently in good health, and that I have successfully passed, within the past two year period, the last physical examination required by my branch of service. (Reserve and Guard personnel not on extended active duty must include with this application a copy of their most recently completed SF88.)

Signature of Applicant _____

Date _____

Application must be accompanied by check or money order. Send remittance to:

INSURANCE DIVISION, AFA, 1750 PENNSYLVANIA AVE., N.W., WASHINGTON, D. C. 20006

2/67

Please indicate below the form of payment you elect:

☐ Monthly government allotment (I enclose \$20 to cover the period necessary for my allotment to be processed.)

☐ Quarterly (I enclose \$30)

☐ Semi-annually (I enclose \$60)

☐ Annually (I enclose \$120)

Category of eligibility (please check appropriate box)

☐ Active Duty, Air Force

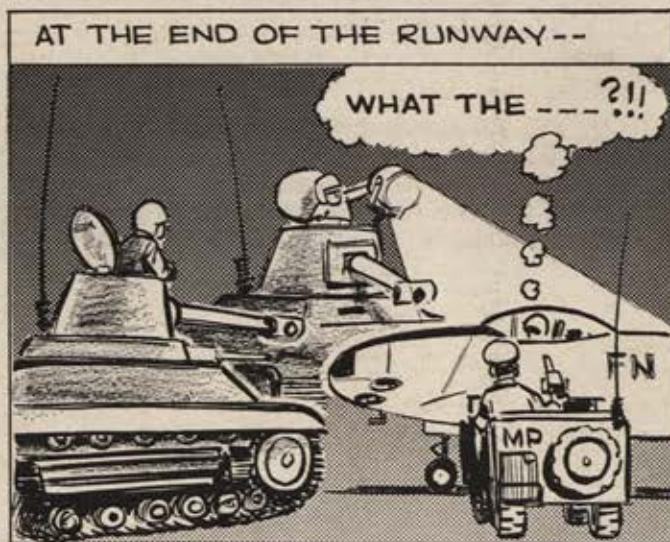
☐ Ready Reserve, Air Force

☐ Air National Guard

Bob Stevens'

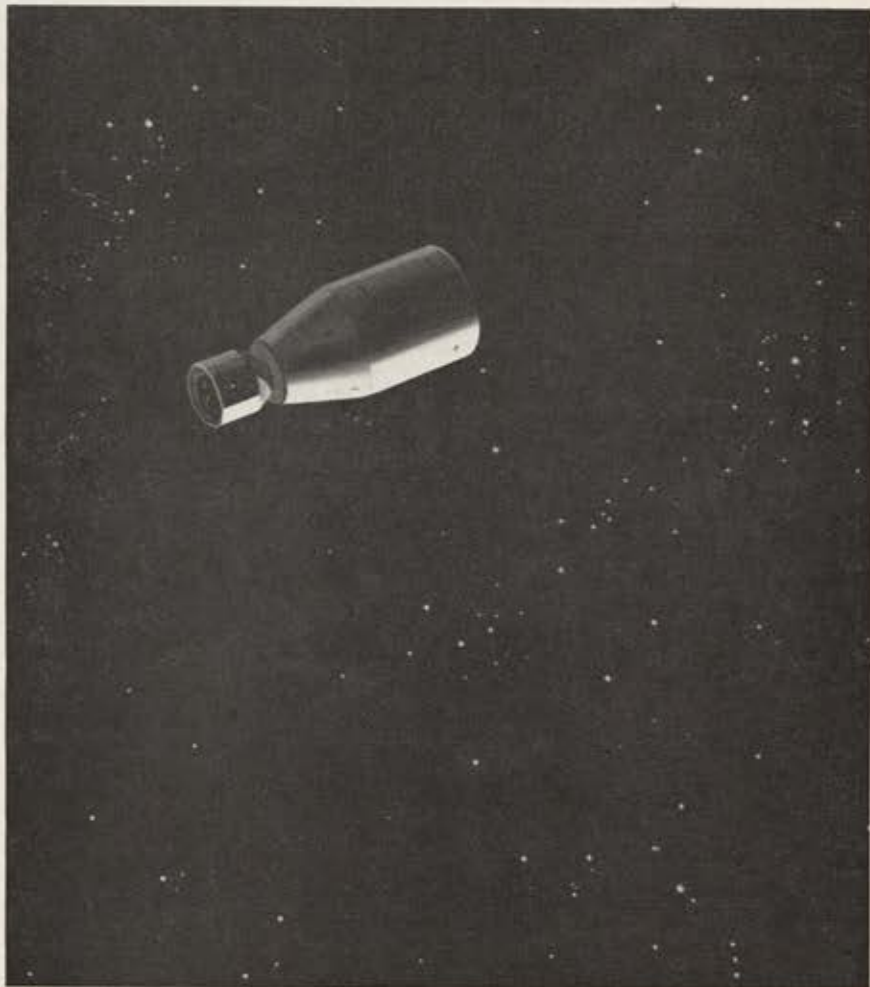
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